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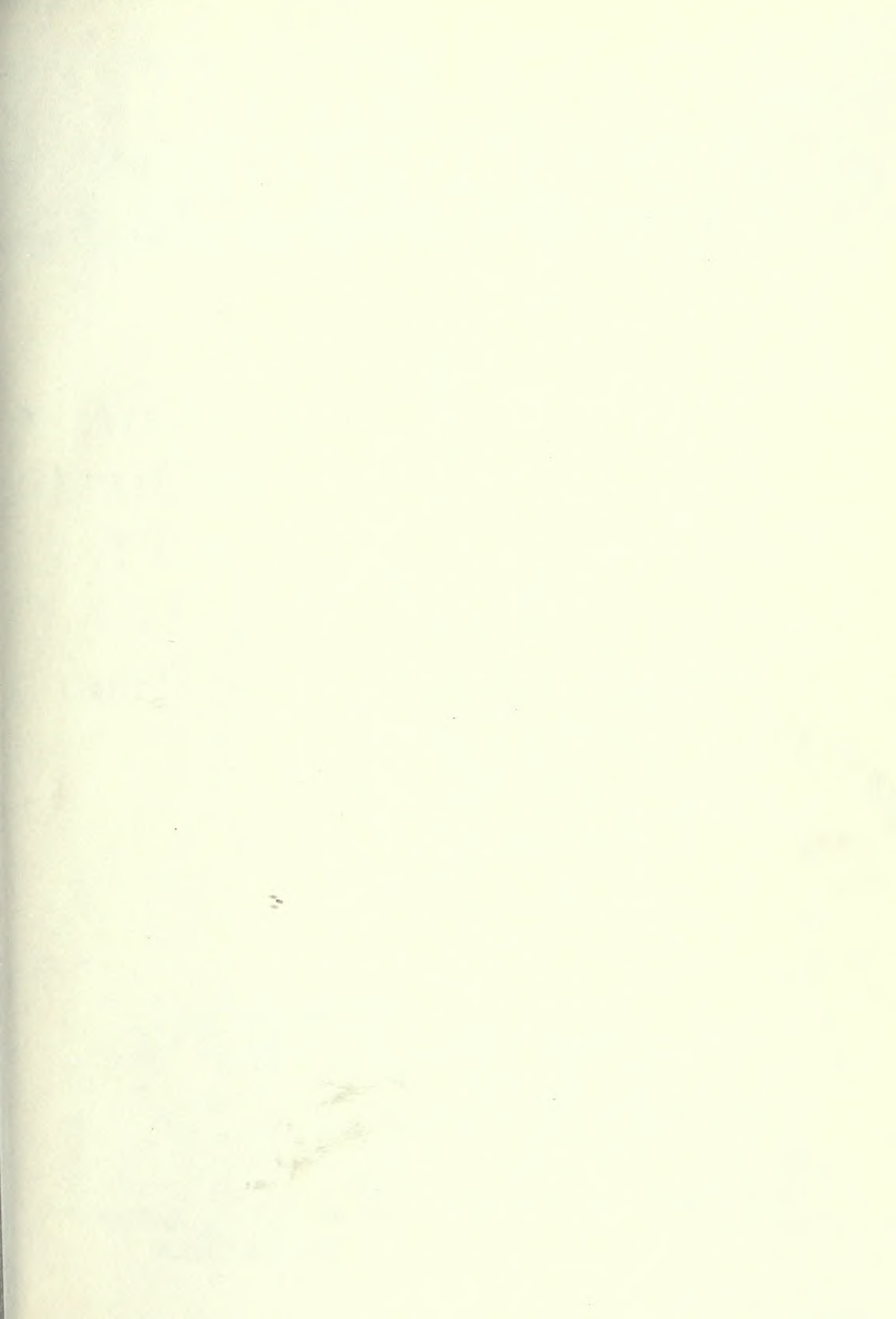
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ELECTRIC RAILWAY JOURNAL

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A Body as
advanced
as the
A. C. F.
chassis

UNDERNEATH the Observation Section goes the baggage — fully protected. No wheel housings in the passenger compartment. Sounds from tires, wheels and road entirely cut off from the passengers. The quietest mass transportation ever known!

The Strongest Revenue-Producer

in bus history is the A. C. F. Observation Coach. Great operators are proving it. Gone is the baggage problem. Gone are wheel-seats and tire sounds! All seats are good and the rear fills first! Full capacity with full comfort. An exclusive body betterment comparable only to the chassis advancements that give A. C. F. coaches their lead in ability, economy and business-attraction.

AMERICAN CAR AND FOUNDRY MOTORS COMPANY
30 CHURCH STREET • NEW YORK





Coat of Arms of
the City of Pittsburgh

Pittsburgh

The City of Power

BACK of Pittsburgh's industrial pre-eminence lies a wealth of romance, discovery and invention.

Where Pittsburgh now stands a great battle was fought in 1758 between the French and English, and the resulting victory of the English established the English language in the greater part of the continent for all time.

The English settlement that sprang upon the site of the French Fort Duquesne was called Pittsburgh in honor of the Prime Minister of England.

Its strategic location on the Ohio River at the head of that great network of inland waterways immediately assumed importance as a trading post.

But it was the discovery of iron ore near by, practically inexhaustible deposits of coal and natural gas, developed by the genius of such men as George Westinghouse, that destined Pittsburgh to be the greatest industrial marvel of the age.

Today Pittsburgh is called the Steel City of America. With a metropolitan population of nearly one million and a half, she makes one-fifth of the nation's pig iron and one-fourth of its steel.

Pittsburgh boasts the largest steel fabricating plant, largest wire plant, largest aluminum plant, the largest air brake plant and the first radio broadcasting station in the world.

Here also is located the great Westinghouse Electric Works. In this plant were developed many of the principles and much of the machinery that have made the huge industries and great cities possible.

And Pittsburgh progress has not been limited to the industrial field. The public service corporations, led by the Pittsburgh Railways Company, have at great expense and labor overcome the handicaps imposed on the city by the rough terrain and extended the trading area far into the country.

By tunnels, cuts, and bridges, they broke through the barrier of high hills of solid rock that had virtually held the city prisoner and built up the outlying districts into valuable suburban property.

One small section, known as the South Hills district with a population of only 7337 and an assessed real estate valuation of \$2,794,000 in 1900, increased to a population of 55,800 and an assessed valuation of \$64,725,000 in 1927 after the Washington Tunnel was bored by the Pittsburgh Railways Company to extend car service into the district.

This railway, which is doing much to advance Pittsburgh's interests by furnishing the best transportation of any city of its topography in the United States, is Westinghouse-equipped throughout.

Westinghouse Electric & Manufacturing Company
East Pittsburgh Pennsylvania



1927

Westinghouse

X92792

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No. 10

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Plenty of

Food for Thought

PLENTY of food for thought will be found in the Annual Convention Number of the JOURNAL, which will be dated Sept. 17. "Meeting the demand for better transportation" is the theme. What could be timelier or of more interest to the industry at this critical stage of its history?

Not only is the general subject timely, but the treatment is on the broadest possible basis. Executives of outstanding ability and experience in the various classes of transportation present in addition to their own experience the results of similar operations on other properties. Each article is in a measure a survey of the industry's experience to date in meeting the demand for better transportation as it affects various classes of service; small city systems, medium size properties, heavy surface lines, rapid transit, commutation service of railroads, bus operation, taxicabs, etc.

This year's convention issue is published a week earlier than usual, to give everyone in the industry an opportunity of digesting this comprehensive survey of experience and thought before starting for Cleveland.

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Engineering News-Record

American Machinist

Power

Chemical and Metallurgical Engineering

Cool Age

Cool Age News

Engineering and Mining Journal

Ingénieur International

Bus Transportation

Electric Railway Journal

Electrical World

Industrial Engineering

Electrical Merchandising

Radio Retailing

Construction Methods

Electrical West

(Published in San Francisco)

American Machinist—European Edition

(Published in London)



1927

SAVING THE RAIL SAVES THE RAILWAY

*333 amp.
at 500 v.*

*209 amp.
at 300 v.*

150 lbs.



“AJAX”

ELECTRIC ARC WELDER

Do you realize that the “Ajax” is in a class by itself judged by combination of high capacity and low weight? Judged by any other standards, “Ajax” also maintains its lead. Its simple wiring scheme with all circuits in sight, the accessibility of all parts, the ample ventilation, the trolley pole making contact on the bright underside of the wire—these are some of the other features which make “Ajax” first choice on so many roads. Finally—price—lower than you’d expect if you didn’t know.

Why not get a quotation?

Railway Trackwork Co.

3132-48 East Thompson Street, Philadelphia

AGENTS:

Chester F. Gallor, 30 Church St., New York.
Chas. N. Wood Co., Boston.
Electrical Engineering & Mfg. Co., Pittsburgh.
H. F. McDermott, 208 S. La Salle St., Chicago.
P. W. Wood Railway Supply Co., New Orleans, La.
Equipment & Engineering Co., London.
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SAVING THE RAIL SAVES THE RAILWAY

DOLLARS AND SENSE

Hangers, too, can contribute to the net!



It's the many possible s. all savings, easily made, that help most to swell the "net". Let O-B Hangers contribute their share.

MANY pieces of equipment, excellent in themselves, fail to produce actual overall savings. Longer life in service is desirable enough for trolley hangers, but they must at the same time co-ordinate with, and prolong the useful life of other parts with which they are associated in their work.

O-B Spring Lock Hangers are designed not only to resist wear themselves, but to afford the smoothest possible passage for trolleys. Shocks are reduced to a minimum, and this reduces wear and tear on ears, trolley wire and trolley wheels. The relation of these hangers to the life of the trolley wire and to trolley breaks is the consideration of greatest moment. O-B Hangers will prove it on your lines.

Ohio Brass Company, Mansfield, Ohio
Dominion Insulator & Mfg. Co., Limited
Niagara Falls, Canada
482B



O-B Spring Lock Hanger—Span Type
Here is a device which takes the last "hard spot" out of the overhead line and affords a quietness and smoothness of operation heretofore unobtainable. An efficient coil spring between the stud and the hanger body absorbs the impact from pounding trolley wheels. Cat. No. 14532.



O-B Spring Lock Hanger—Barn Type
The same coil spring construction is used as in the span type hanger, shown at the left. This model is adapted to car houses, underpasses and trolley troughs, and eliminates the disagreeable pounding noise usually heard in such places. Cat. No. 14533.



O-B Lock Hanger—Span Type
Correct alignment and an absolutely tight joint are achieved. The customary looseness where ears are backed off to secure alignment is avoided by means of the steel spring washer inside this O-B hanger, which eliminates all play. Cat. No. 11062.

Ohio Brass Co.

PORCELAIN
INSULATORS
LINE MATERIALS
RAIL BONDS
CAR EQUIPMENT
MINING
MATERIALS
VALVES

SALES OFFICES: NEW YORK CHICAGO

PHILADELPHIA PITTSBURGH CLEVELAND
SAN FRANCISCO LOS ANGELES

REAL WHEEL STEEL



A WHEEL can be no better than the material of which it is made.

Davis "One-Wear" Steel Wheels are made of Real Wheel Steel.

It contains elements that when heat-treated produce physical characteristics that make the "One-Wear" idea practical.

IT IS A REAL "ONE-WEAR" WHEEL METAL

AMERICAN STEEL FOUNDRIES

NEW YORK

CHICAGO

ST. LOUIS

facts

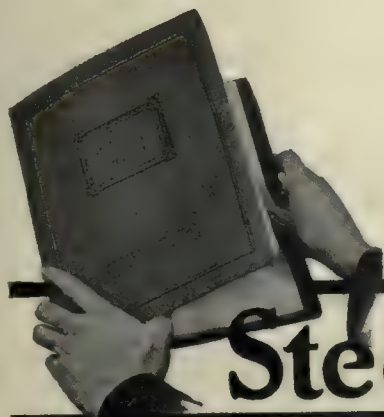
On more than 200 American Electric Railways, twin Ties have cost less to install, less to maintain and have given better service, than any other kind of ties used in paved track construction.

STEEL NEVER FAILS

Twin Ties are built of steel because of its perfect adaptability to paved track tie construction. Twin Ties have never failed to do their part, to carry their load, to give the years of service expected of them. The best is always the cheapest.

May we quote you on your paved track work?

The International Steel Tie Co.
CLEVELAND, OHIO



Look it up in your "Paved Track Note Book"

Steel Twin Tie Track

TWIN TIES ARE ALL STEEL

Safeguard and Accelerate Traffic

Automatic Signals by providing proper spacing of cars or trains, reduce trip time and enable more cars to be operated with consequent safety.

Interlocking installations at terminals and at grade crossings eliminate unnecessary stops and assure route continuity by means of signal indications.

Highway crossing protective devices of the flashing light, automatic flagman, or audible type, or combination of same, are a dependable insurance which soon pays off the investment.

Power operated remotely controlled switches are being used economically to accelerate Electric Railway traffic.

These Systems are products of the



Union Switch & Signal Co.

SWISSVALE, PA.





Make it your buying guide— **ESSCO CATALOG No. 7**

Some items found
in ESSCO CATALOG No. 7

Golden Glow Head-	Trailer Connectors
lights	Automatic Door
Faraday Signal	Signals
Systems	Standard Trolley
Hunter-Keystone	Harps
Signs	Standard Trolley
Steel Gear Cases	Wheels
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Lighting Fixtures	Tools
Headlight Resistances	Peerless Armature
Air Sanders	Machines
Trolley Catchers	Insulating Materials
Shelby Trolley Poles	Cass Commutator
Rotary Gongs	Stones
International Fare	Sand Driers
Registers	Peerless Pinion
Fare Register Fittings	Pullers
Samson Cordage	Employees' Badges
Air Valves	Line Material
Cord Connectors	Portable Lamp
	Guards

You will find in ESSCO Catalog No. 7 hundreds of devices, parts and supplies — listed, described and illustrated.

Whether it is the tiniest screw in a Faraday Buzzer, the lens or reflector for a Golden Glow Headlight, or any other part of Keystone Car Equipment you can identify and order it by the catalog number.

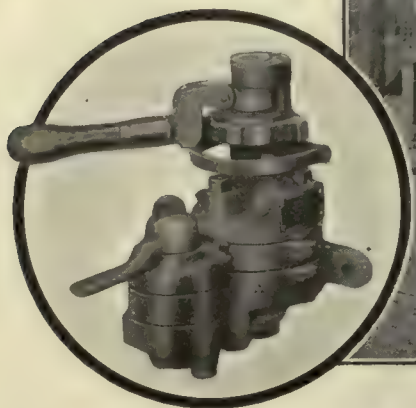
Keep ESSCO Catalog No. 7 always on hand for ready reference.

Send today for your copy!

ELECTRIC SERVICE SUPPLIES COMPANY
PHILADELPHIA, 17th & Cambria Sts.; NEW YORK, 50
Church St.; CHICAGO, Ill., Merchants Bank Bldg.;
Pittsburgh, Bessemer Bldg.; Boston, 88 Broad St.; Detroit,
General Motors Bldg.; Scranton, 316 N. Washington Ave.;
Canadian Agents, Lyman Tube & Supply Company, Ltd.,
Montreal, Toronto, Vancouver.

ELECTRIC SERVICE SUPPLIES Co.

MANUFACTURER OF RAILWAY, POWER AND INDUSTRIAL ELECTRICAL MATERIAL



Making each passenger his own brakeman!

Each passenger boarding a car adds more weight to be controlled by the brakes.

If the ordinary air brake equipment is used, this additional weight will result in a longer stopping distance than when the car was empty—particularly if the car is of the modern light weight type. The longer stop reduces the schedule speed and slows up transportation service for the passenger.

If Westinghouse Variable Load Brakes are used, however, the weight added by each passenger entering the car does not

remain uncontrolled, but is used to automatically adjust the brake mechanism so that a corresponding increase in retarding force is made to assure the same stopping distance as before his extra weight was added. Each passenger thus unknowingly helps to safeguard and expedite his journey.

This modern brake for modern cars makes for safer and faster transportation, because uniformly short stopping distances are assured by virtue of automatic adjustment of brake cylinder pressure as the passenger load changes.

Equip your modern cars with modern brakes!

WESTINGHOUSE TRACTION BRAKE CO.
General Office and Works, WILMERDING, PA.

WESTINGHOUSE TRACTION BRAKES

33¼ per cent increase in revenue

because —

they kept their

Coaches busy !



Washington Railway and Electric Company

What a 171% Mileage increase in Charter Business did for the Washington Railway and Electric Co.

With a fleet of 38 Yellow Coaches, the Washington Railway and Electric Company enormously developed their special charter business, turned idle equipment during non-rush hours into producers of profitable mileage, decreased operating expense and watched their revenue increase $33\frac{1}{4}$ per cent during the first six months of this year as compared with the first six months of 1926.

There is no magic about this record, no clever juggling of figures to make black look like white. Direct from the Comptroller's Office comes the data assembled on the op-

posite page. The accomplishment can be laid to the door of keeping motor coach equipment on the road, where it can earn *plus* the use of Yellow Coaches on routes and in service where the revenue earning ability of Yellow Coach equipment may have the fullest opportunity to demonstrate its value.

Co-ordinating motor coach service with their street cars, on regular routes, the company found a profitable way to take up the non-productive slack caused by idle motor coach equipment during the non-rush periods.

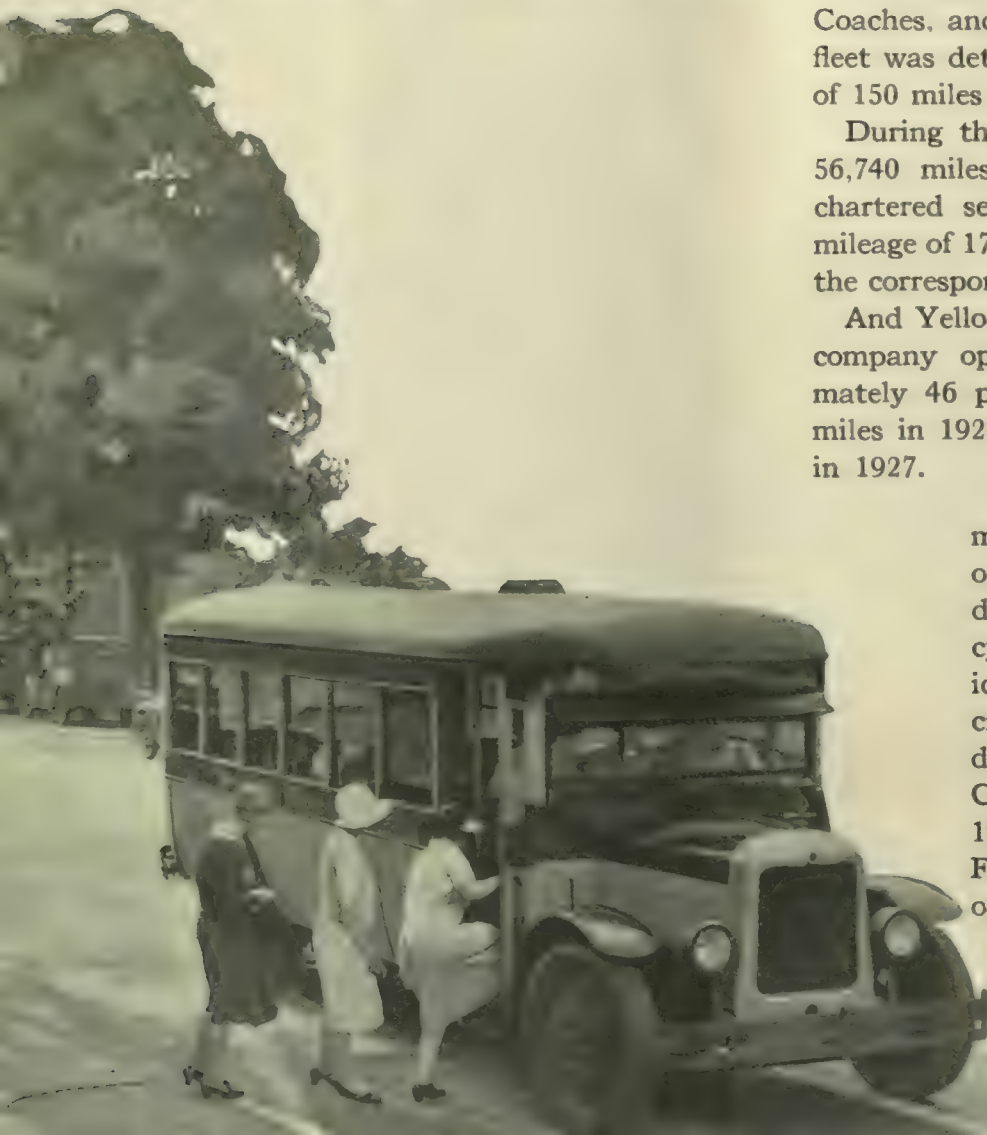
This responsibility was thrown upon Yellow Coaches, and a section of the Yellow Coach fleet was detailed to operate within a radius of 150 miles out of Washington.

During the first six months of this year, 56,740 miles were covered by this special chartered service; a percentage increase in mileage of 171% on this class of business over the corresponding period in 1926.

And Yellow Coach mileage over the entire company operation has increased approximately 46 per cent; 918,017 Yellow Coach miles in 1926 and 1,337,000 estimated miles in 1927.

Coincident with this increased mileage has been a decrease in operating costs—5.07 per cent decrease for Yellow Type Z 6-cylinder, 29-passenger, City Service Coach and 13.22 per cent decrease for Yellow Type X 6-cylinder, 21-passenger, City Service Coach in June, 1927 over June 1926.

Figures talk. Study those on the opposite page.



O

perating cost of Yellow Coaches per mile

Z type-23.76 cents

X type-17.24 cents

Operating, Mileage and Earned Revenue Figures

	Type "Z"	Type "X"	Total
Total mileage operated in 1926.....	703,993	214,024	918,017
Mileage operated during first 6 months of 1927.....	510,380	158,606	668,986
Estimated mileage to be operated in 1927.....	1,020,000	317,000	1,337,972
Percent of mileage increase (1927 estimated) over 1926....	45%	48%	
Number of miles added to 6/30/27 over last year as regular routes.....	6 miles		
Total one-way mileage of these routes combined.....	41.24		
Number of regular routes covered by Yellow Coaches.....	6		
**Mileage covered for first 6 months of 1927 on special chartered buses.....	56,740		
Percent increase in mileage on this class of business over corresponding period in 1926.....	171%		
Per cent decrease in operating costs (per mile).....	5.07%	13.22%	
*Per cent of revenue increase — 6 months ended June 30, 1927, over same period for 1926.....	33.25%	35.25%	

* Includes all makes of buses owned by company; Yellow Coaches predominating.

** Yellow Coaches in special chartered service.

Operating Costs per Mile

	Type "Z" 6-cylinder 29-passenger City Service Coach Cents Per Mile	Type "X" 6-cylinder 21-passenger City Service Coach Cents Per Mile
Operators' wages.....	6 28	6 28
Starters, inspectors and instructors' wages.....	19	19
Gasoline.....	3 24	1 84
Lubricants.....	60	36
Tires and tubes.....	1 49	92
Body repairs.....	45	16
Chassis repairs.....	1 76	1 46
Painting.....	10	12
Battery maintenance.....	08	01
Shop inspection (labor).....	18	16
Cleaning buses.....	41	14
Garage labor.....	72	72
Garage supplies and expenses.....	25	25
Depreciation.....	4 87	1 53
Insurance.....	06	02
Miscellaneous and general.....	1 87	1 87
Taxes.....	1 21	1 21
Total.....	23 76	17 24





Steady growth — built the **YELLOW COACH FLEET !**

Thirteen times in a little over two years have orders been placed by the Washington Railway and Electric Company for Yellow Coaches. A few Yellows ordered at a time, but these reorders were constant and spread out over many placements.

Building a fleet in this manner is building on a basis of confidence. Performance *must be right* to justify so many reorders. Economy of operation *must* be marked. As the company states, "Never in any one month has body and chassis maintenance been over $2\frac{1}{2}$ cents per mile on Yellow Z's or over 2 cents per mile on Yellow X's."

Yellow Coach plus General Motors earns recognition by the vast transportation and manufacturing experience vested in its product.

Users of Yellow Coaches get more for their money than mere units of equipment. Only exceptional engineering knowledge, familiarity with all phases of transportation problems, exhaustive research and the most modern manufacturing methods can determine what to build, how to build and how to assure low-cost, profitable miles.

How the Yellow Coach Fleet Has Grown

YELLOW Z TYPE

Date	Quantity
May 5, 1925	2
June 3, 1925	4
Nov. 12, 1925	2
Dec. 5, 1925	2
Jan. 12, 1926	4
Mar. 2, 1926	4
Nov. 16, 1926	4
Dec. 31, 1926	4
May 3, 1927	6
Total	32

YELLOW X TYPE

Nov. 4, 1925	2
Feb. 9, 1926	1
Feb. 28, 1927	3
Total	6

YELLOW COACHES

YELLOW TRUCK & COACH MANUFACTURING CO.

SUBSIDIARY GENERAL MOTORS CORPORATION

5801 WEST DICKENS AVENUE, CHICAGO, ILL.

From Electric Railway Journal of July 30th

In Reference to Remodelled Cars in Kansas City



metal view of sun shield adds to the appearance of the car.

The total width of entrance and exit doors has been increased. Folding front doors are used and both doors operate at the same time. The pneumatic door engines are controlled from the engineer's valve, or from a street fare taker's valve accessible from the outside. Treadle control is installed for the rear exit door. These changes provide increased schedule speed as there is less interference between streams of boarding and alighting passengers, so shorter length stops result.

The improved controller equipment includes line

NATIONAL PNEUMATIC COMPANY

Executive office, Graybar Building, New York

General Works, Rahway, New Jersey

CHICAGO
518 McCormick Building

MANUFACTURED IN TORONTO, CANADA, BY
Railway & Power Engineering Corp., Ltd.

PHILADELPHIA
1010 Colonial Trust Building

CINCINNA

for

meeting



CINNATI

still a step

CINCINNATI BUILDS 1928

The demand for better transportation

CINCINNATI builds to meet the needs of what will be, perhaps, the most significant year in transportation history.

CINCINNATI builds lightweight cars capable of showing a steady profit under modern operating conditions.

CINCINNATI builds cars that, through the past year, have demonstrated beyond question that "The Four Features of BALANCED DESIGN are the Cardinal Points of today's Demand."

**BALANCED
LIGHTWEIGHT**

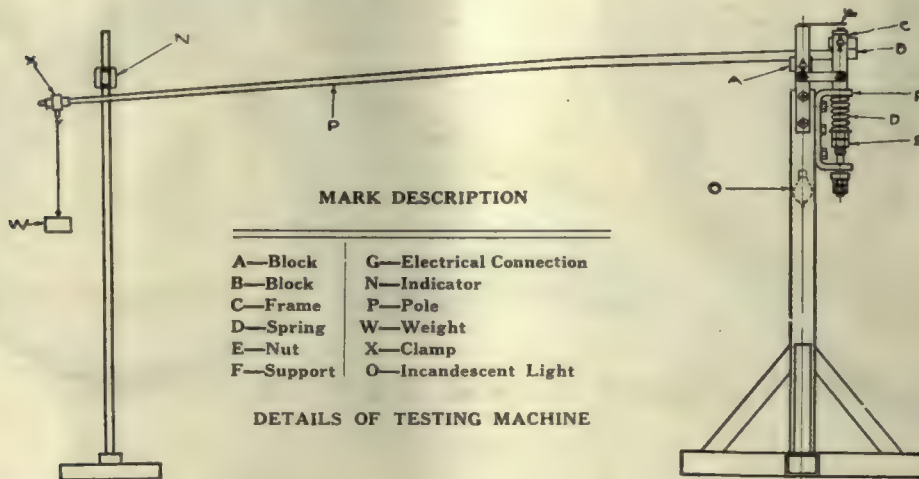
CARS

ahead of the modern trend!

The Test That Tells for your TROLLEY POLES

A test, approximating service conditions, is applied to every standard "NATIONAL-SHELBY" Trolley Pole before it leaves the mill. This test is made on an improved testing machine in which the trolley pole is treated as a cantilever. This machine infallibly indicates the presence of a permanent "set" in the pole, or any imperfections which would impair its usefulness.

The base of the pole under test is set horizontally in the grips of the machine, after which a deflection gage is set, corresponding to the height, from the floor line, of the free end of the pole under no load.



The proper weight for the pole being tested is then hung on the free end of the pole, and an adjustable electrical contact is set so that the tension on a spring in the testing machine, when the pole is so loaded, is sufficient to close the current of an incandescent lamp. After this adjustment is made, the weight is removed and the return of the trolley pole is checked with the deflection gage.

After the first pole of a particular lot has been so tested and the proper adjustment determined for closing the electric current, the remaining poles of the lot are tested by placing them in the machine one at a time, the operator deflecting each pole sufficiently to cause the lamp to light; after which the pole is tested for permanent set or deflection.

Any pole that does not return to its original position after deflection is rejected.

This test is your assurance that

"NATIONAL" SHELBY

*Trolley Poles will meet your severest
conditions in a dependable manner.*

Ask for Booklet.

NATIONAL TUBE COMPANY, PITTSBURGH, PA.

GENERAL SALES OFFICES: FRICK BUILDING

DISTRICT SALES OFFICES

Atlanta Boston Chicago Denver Detroit New Orleans New York Salt Lake City Philadelphia Pittsburgh St. Louis St. Paul
Pacific Coast Representatives: U. S. Steel Products Co. San Francisco Los Angeles Portland Seattle
Export Representatives: U. S. Steel Products Co. New York City

Last week

These cities met a paralyzing apathy with new quality cars.

—and to public confidence

When electric railways have had the courage to face the transportation and apply up-to-date modern equipment, improvements in service and equipment have been quick to be made. Trial passengers quickly have become regular patrons.

New and improved cars are increasing public confidence in the progressiveness of the street railways, with a resulting increase in business.

Better service is expressed in more frequent headways, higher speed and greater comfort. Lower operating costs are attained through decreased maintenance of equipment and track. Lower power costs are made possible by reduced weight in modern cars. Improved equipment means better service to the public. In electric railways, progress is a progressive enterprise. In electric railway operation, when you serve others, you cannot help but serve yourself.

Make new light-weight St. Louis Cars part of your program to improve your service to the community. In making material interest and friendship more than a virtual evidence of progress.

New St. Louis Cars have met the public half-way in these lines. Why not in yours?

St. Louis Car Co.
Quality Cars

Passenger Miles

ELECTRIC RAILWAYS	STEAM RAILROADS	MOTOR BUSES	WATERWAYS	TAXIS
48,000,000,000	36,150,000,000	5,300,000,000	3,500,000,000	1,500,000,000

This week—last week and last year

more passengers were carried by electric railways than by the combined totals of all other agencies of public transportation.

It's your job and ours to maintain this position. We have a responsibility no less than yours. Ours lies in bending every resource and effort toward building cars which appeal to a public educated to the comforts and luxuries of modern transportation. Your responsibility is the winning of good-will and building patronage through the operation of such transportation units for the greater convenience of patrons.

The Quality Shops are pledged to the progressive improvement of electric railway equipments and are co-operating with many electric railway operators. *Our facilities are at your service.*

NEXT WEEK

St. Louis discusses another phase of this dual responsibility to the public.

St. Louis Car Co.

St. Louis Car Co.





They Are Playing Their Part

By helping to increase comfort, safety and speed in operation "Standard" Steel Wheels, Armature Shafts, Springs and Axles are contributing toward the ever increasing confidence of those who ride in street cars.



STANDARD STEEL WORKS COMPANY

PHILADELPHIA, PA.

BRANCH OFFICES

CHICAGO
ST. LOUIS
NEW YORK

HOUSTON, TEXAS
PORTLAND, ORE.
RICHMOND, VA.

SAN FRANCISCO
ST. PAUL, MINN.
PITTSBURGH, PA.

WORKS: BURNHAM, PA.



Ten of these cars recently furnished Chicago & West Towns Railway Co.

MODERN CARS Of All Types

for City and Interurban Service

CARS recently built by this company for several properties have brought forth much favorable comment from the public in the various localities. The riding comfort has been especially noted. This is a feature of the modern car that goes far to increase good will and build patronage. Cummings No. 62 Truck, shown on the above car, has contributed largely to the riding comfort of our cars.

CUMMINGS CAR AND COACH CO.

Successors to McGuire-Cummings Mfg. Co.

111 W. Monroe St., Chicago, Ill.



How long can you afford to put off buying equipment that is yielding more than 25 per cent annually? Modern cars are consistently earning this, and more, for progressive properties.

An investment that returned 40 per cent

The Toledo and Indiana Railway in November, 1924, replaced nine old cars weighing 32 tons each with seven modern light-weight one-man cars. In two years these cars have covered approximately 1,050,000 miles.

The new cars reduced maintenance costs 2.01 cents per car-mile, power costs 4.2 cents per car-mile, and platform expense 1.7 cents per car-mile even though there was an 8 cents per hour wage increase on account of one-man operation.

A review of actual operating costs reveals that an investment of \$105,000 is saving annually:

Maintenance of equipment	\$10,060
Power	23,824
Operators' wages	8,784
Total Savings	\$42,668



Reliability, so vital in railway operation, is not sacrificed in the equipment which General Electric produces to effect reductions in car weight. The GE-265 motors, K-35 control, and CP compressors on these new cars are daily proving this statement, as the T. & I. will testify.

GENERAL ELECTRIC

GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y., SALES OFFICES IN PRINCIPAL CITIES

Electric Railway Journal

Consolidation of Street Railway Journal and Electric Railway Review
Published by McGraw-Hill Publishing Company, Inc.
CHARLES GORDON, Editor

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Convention Program Assures Interest at Cleveland

WERE there any doubt in the mind of anyone as to the value of the 1927 Cleveland convention, it would be dispelled by a perusal of the program, published in full elsewhere in this issue. The list of speakers and the arrangement show much care on the part of Chairman Harry L. Brown and his associates on the committee on subjects and meetings.

The morning sessions will be only two hours long instead of three, as in former years. Those on Monday and Tuesday will be devoted entirely to the presentation of addresses by men outside the industry. Many men of prominence in American business, who can bring a new trend of thought to the leaders of the industry, are included among the speakers. Thursday morning's session will be a symposium on the progress of the industry, consisting of five-minute talks by operating executives on the feature accomplishments of the year.

The salient change will be the inauguration of a series of luncheon conferences on fourteen major industry subjects. These necessarily will be limited to small groups, not over 50 each. There will be an opportunity for an informal cross-table exchange of questions, opinions and experience of men thinking along the same line. There will be no set speeches or papers. A sponsor has been selected for each luncheon who will get discussion started and perhaps guide it if the members get too far off the subject. The plan should tend to satisfy the criticism of the younger executives who feel that they never have an opportunity to exchange views with the older men who are leaders in the industry.

The Affiliated Associations Also Have Modernized Their Programs

GLANCING through the programs of the affiliated associations for the Cleveland convention, it appears that they, too, have undergone a metamorphosis similar to that to which the American Association has been subjected. The long list of committee reports which formerly made up the bulk of the three afternoon sessions has been replaced by addresses by men who are authorities on their subjects. As the committees have their reports prepared and printed in advance, formal acceptance is all that is necessary unless the delegates take issue with one more of the recommendations. As a rule comments are forwarded to the chairman in writing, so that even in this event there is not always need for discussion on the floor.

The Engineering Association, of course, has many technical committees which make standards for the industry that must be acceptable to a large number of operating companies if they are to become effective. Even here an innovation has been found possible which will rectify one of the great difficulties of the former

conventions, that of too great a waste of time of all the delegates discussing details in which they have little or no interest, or worse still, listening to such a discussion while waiting for their own specialties. The Tuesday session will be divided into four groups, the subjects being primarily way and structures, rolling stock, purchases and stores, and power. Delegates can then attend the sessions in which they have greatest interest and will be in a position to discuss intelligently those features with which they are vitally interested.

What Are the Manufacturers Going to Do About It?

PRELIMINARY figures submitted to the executive committee at its recent meeting in Cleveland indicate some question regarding the proportions and character of the car exhibit planned for the coming convention. President Sawyer pointed out in no uncertain terms the responsibility which every manufacturer and operator has for giving particular thought to the importance of an impressive and representative car exhibit at this year's convention.

The big problem before the industry today is that of providing a type of car which will attract riders. Appearance, comfort, quietness, speed and safety are the big selling requirements. There is nothing inherently to the advantage of the rubber tired vehicle in these respects, with the possible exception of flexibility. To offset this, the car has many advantages and presents a problem in design much simpler than does the automotive vehicle carrying its own power plant. The mistaken notion that there exists a mysterious "rubber urge" has been almost completely dissipated. But there is in transportation a definite demand for "style," to use that word for want of a better term—and the rider doesn't care particularly whether it comes on rail or rubber.

Imagine really modern cars on the streets today, with automobiles of the vintage of even only ten years ago, and there is presented the reverse of the situation that now exists. There wouldn't be much difficulty about selling street car rides under those conditions. But the automobile manufacturer has been too alert for that. When he ran out of other improvements for his vehicle, he developed balloon tires and four wheel brakes.

Surely, the electric railway market today presents one of the most unusual merchandising situations in the history of American industry. The customers demand that the manufacturers show their wares. Railway executives insist that the builder who has cars to sell bring along his goods for them to look at. President Sawyer and the executive committee made it perfectly clear that the industry needs an impressive car exhibit. Operators are keenly interested to know what can be done to win back former patrons who are paying from 15 to 30 cents per mile for transportation which they consider more attractive.

Space for approximately 20 cars has already been reserved and there is still reasonable assurance that the exhibit will at least equal if not exceed that of last year in the number of cars shown and in the extent of development represented. But the time is getting short. The convention went to Cleveland in order to make a large car exhibit possible. President Sawyer has challenged the spirit of the manufacturers as reflected in the space applications for car exhibits. What are they going to do about it?

Will Chicago Persist in Delay?

SERVICE by bus established by the Chicago Surface Lines in Diversey Parkway forms the subject used by the *Chicago News* to point a moral and adorn a tale. The moral is that Chicago needs "co-ordination on a city-wide scale." That paper says that for the same reason, bus service in Diversey Parkway, operated by the electric railway and made a part of its transportation system, is better and cheaper than would be an independent bus service on that thoroughfare, a close, co-ordinated, non-competitive system, providing both neighborhood service and rapid transit through buses, street cars, elevated and subway trains, would be an immense improvement over present conditions. That, of course, represents in essence the idea behind the program for co-ordination advanced for approval at the last session of the Legislature, but lost at that time on account of bickering over details. That mistake Chicago will have a chance to correct at the promised special session of the Legislature.

The *News* urges the people now to support the efforts of the local transportation committee of the City Council to bring about by negotiations a city-wide unified service to suit the needs of all the citizens. Of course, no announcement to that effect has been made, but in its enthusiasm for the idea the *News* says it may be assumed that, legal doubts having been cleared away by litigation, the auxiliary service of buses will be extended by the railway to various other sections now lacking proper transportation. That, of course, is mere prophecy. There is, however, nothing fanciful about the immense advantages that would be derived by the people of Chicago from a unified subway, elevated, street car and bus service, furnished at cost. Under the existing competitive service of surface cars, elevated trains and buses patrons pay the cost in inconvenience and delay, if not in double or triple fares. The wonder is that the pettishness of politicians should be permitted to interfere with the acceptance of facts self-evident.

Speed—A Vital Factor in Transportation

SPEED, and yet more speed, is a demand that ever has dominated transportation, public or private. For ages inventors have dreamed of means to annihilate space. Many of their schemes have been attended with some great measure of success, as witness the transportation systems of today. Horse cars were introduced with the idea of a more rapid means of travel, and they were electrified for the same reason. The advent of the bus had much the same idea in mind, to provide a vehicle faster than the best street railway cars. As yet it has not shown much superiority, and cars and buses give service on city streets that differ little if at all with respect to speed.

Of late years so many restrictions have been placed on the movement of vehicles in city streets that both cars and buses have been forced to reduce schedule speeds rather than to increase them. After fruitless attempts to modify onerous regulations, managers have been prone to take the position that Mark Twain did with respect to the weather, talking a great deal and doing very little.

It is refreshing to have an entire meeting of a utility association devoted to the subject of "Increased Speed with Safety," as the Transportation Section of the Wisconsin Utilities Association did last week.

It appeared to be the general opinion that transportation men have not done anything like all they can to obtain higher speeds. That there is an opportunity to get materially reduced running time for cars and buses without an increase in danger and frequently without any increase in the maximum speed of the vehicle, was shown by several of the speakers. The paper by E. J. McIlraith, staff engineer Chicago Surface Lines, published last week, gives many reasons advanced for delays on the average car trip, all of which tend to reduce the average speed. Some of the causes listed are inherent to public transportation, so that at best their influence can only be minimized. Others, while they may be observed on many systems, are not at all necessary, and a determined effort may eliminate them entirely. J. H. Lucas, in the article published this week, stressed the importance of much higher acceleration and braking rates than those in common use today. These will permit the street car to keep its place alongside the modern automobile whereas now even the truck can frequently pass the car.

In any event a careful analysis of conditions on any property will disclose a number of means by which delays can be minimized and the schedule speed correspondingly improved.

The Press as a Public Relations Agent

SPEAKING before the newspaper group of the International Advertising convention at Denver recently, J. C. McQuiston of the Westinghouse organization laid down eight reasons why his company favored the daily press as a medium for advertising and good will. Briefly, these were: Intimacy, flexibility, dealer tie-in, reader interest, immediate sales, co-operative good will message, sales support and checking results.

While all of these points may be and are applicable to the public utility advertising and public relations, the fourth point merits special discussion. In explanation Mr. McQuiston remarked:

Fourth, reader interest. The newspaper habit has caught every worth-while American and he buys and reads his daily paper. Any message, therefore, in the newspaper comes to him fresh and welcome.

Reader interest! That is what every publicity writer desires above everything else. If it is secured, then there are returns on investment greater than can be shown by cold figures. Especially is this true when one seeks to exchange honest intentions for the good will of a community; when one barter a "mental commodity" for a price that is equally as intangible. This leads us to the question of which is best, mass approach or private approach; in other words, in the public utility field, the pamphlet, dodger and poster as compared with display space in the daily press. With the former method the company's message is generally read when the reader is riding alone, when his mind in many cases is dis-



This recent garage at Berlin will hold 200 buses. Washing and inspection are carried on in the bay shown at the right

Berlin Erects A 200-Bus Garage

One bay is devoted to the daily cleaning, washing and inspection of every bus operating from the garage. The filling station is fitted with overhead charging pipes and can fill two buses a minute

IN BERLIN co-ordination of the bus, street railway and rapid transit service of the city has progressed much farther than in either London or Paris. In the German capital the city exercises control through stock ownership of the three companies operating the several services. Of the three means of transport the street railway, at the same flat fare charged by all, is the most profitable. The bus service is about carrying itself, and the city uses the surplus which it earns from its street railways to build extensions of its rapid transit lines.

In May, 1927, 490 buses were being operated by the bus department of this combined system, the Berlin General Omnibus Company, and 100 more were under order. Most of the buses are mounted on either N.A.G. or Bussing chassis with bodies built in the shops of a manufacturing company associated with the bus company, conducted under the name of Wagen Bauwerke, G.m.b.H.

The newest garage of the Berlin General Omnibus Company is on Helmholtzstrasse and is shown in the accompanying illustrations. It was begun in the spring of 1925 and finished in October, 1926, at a cost of about 1,500,000 marks (\$360,000). It is probably the most complete in equipment of any in Europe, possibly else-

where as well. It has accommodations for 160 buses, with the possibility of increasing this number to 200 without great difficulty.

Structurally, the garage is of steel girder construction with a great deal of glass in the roof and a span for the main part of the building of 53.5 m. The depth is 90 m., making this open area without columns about 175 ft. wide by 295 ft. long. Adjoining this space, used for the daily storage of buses, is an open bay extending the length of the garage, 18.6 m. (61 ft. wide), known as the wash and inspection bay. Adjoining the latter is a two-story building, also extending the length of the building and 10 m. (33 ft.) wide for carrying on light repairs, charging batteries, general storage, etc., with part of this extension opening on the main floor. The gasoline charging station and superintendent's office are in a separate building a short distance away.

EVERY DAY WASHING AND INSPECTION OF CARS

The bay called the washing and inspection room is a busy place between 10 p.m. and 6 a.m. All buses entering the garage in the evening before 10 o'clock are run to the western side of the garage unwashed. Beginning

at 10 o'clock these buses, with those arriving later, follow a regular course. In the first place, the interior is cleaned by being swept or mopped out and the upholstery of the seats is "vacuumed." In the second position the buses pass through the washing stand. In this washing machine the spraying pipes for the sides of the bus are in three horizontal rows and are mounted on small wheels so that the position of the stands is adjustable to a certain extent. The stands are supplied by water from above by flexible hose. There is also a spray from above and from the ends. After being thoroughly washed by these sprays, the bus proceeds to the third position, where any lumps of sticky dirt which have remained on the body, chassis or wheels during the spraying process are washed off with water from a hose directed by hand. To economize on water the nozzles on this hand hose have special valves which cut off the water two seconds after the nozzle has been released by the hand of the employee engaged in washing. In the fourth position the bus is dried and polished.



All gasoline taken at filling station is carefully measured by these instruments



Buses are charged at this filling station from overhead pipes



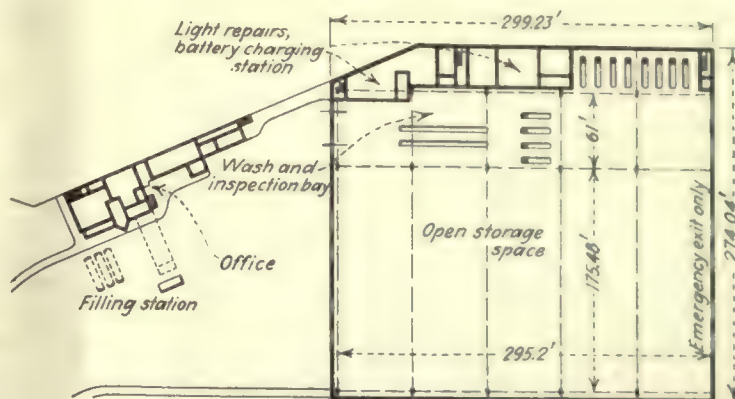
At left, the washing and inspection as seen from the repair pits. At right, column for roof with hot air heater and telephone booth and base protected by wooden curb against sideswiping of bus

In winter the water used for washing is kept at a constant comfortable temperature by an automatic heat regulator. The washing process takes three minutes in all.

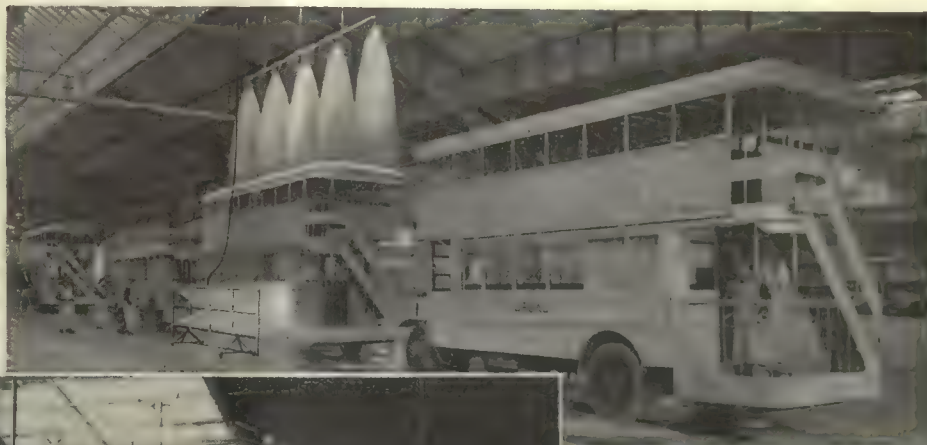
Drains under the washing stand are arranged to trap the dirt before the water flows off into the sewer.

From the washing stand the bus goes to the inspection pits, where it remains about twelve minutes. During this time the buses are greased from below while the batteries are being changed, the spark plugs examined and the oil reservoir for the motor is being filled from above from a portable oil tank, which measures the oil put in each bus. This inspection and change of batteries are done to each bus daily. The inspection pits are lighted and heated as well as fitted with electric power sockets and compressed air connections. They are connected with each other and with the repair pits by an underground passage so that any material needed can easily be brought to the pit workers.

One of the illustrations on page 388 shows a near-by view of these inspection pits. On



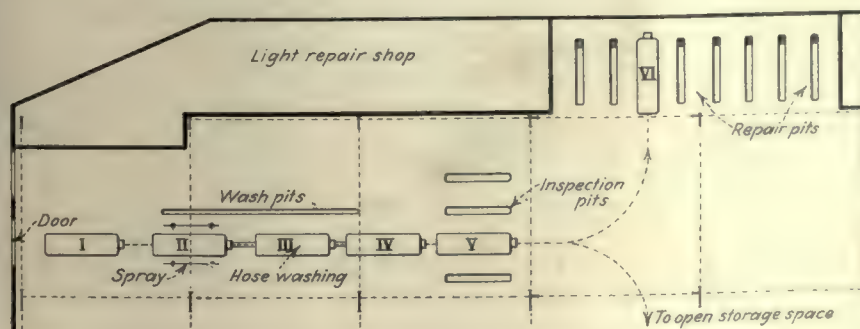
General plan of garage with adjoining filling station



The daily cleaning and inspection includes (1) vacuuming the inside, (2) spray washing, (3) hose washing, (4) inspection



The spraying racks are mounted on wheels so they are adjustable in position. They are connected to the water supply above by flexible hose



Every bus follows a regular daily course of washing and inspection

the right of the pillar in the foreground is a blower forming part of the general steam and hot air heating system of the garage. On the left of the pillar is a telephone booth. The view also shows the oak protecting curb which has been built around the bases of the pillars to prevent any sidwiping or endwiping of them by a bus.

The examination of every bus at the inspection pit determines whether it shall go to the operating or south side of the garage, ready for service, or to the repair pits on the north side.

Fire protection for the garage is supplied by a sprinkler system as well as by the provision of a number of chemical extinguishers and sand pails.

The filling station is in a separate building some distance away from the garage, for fire protection purposes, and is of an uncommon type in

that the filling pipes are supported on an overhead structure or bridge. Before adopting this design the management considered the two more common methods of post connection and side wall connection for filling stations, but adopted the overhead plan as more compact and rapid, since it permits two buses to be charged with 100 liters (26½ gal.) of gasoline each in a minute. The plan adopted is held equally safe from a fire standpoint.

The main supply of gas is stored in three underground tanks adjoining the outer support or pillar of the bridge. Each of these tanks has a capacity of 60,000 liters (16,000 gal.). Gasoline is brought to these tanks in the company's own 50,000-liter tank wagons, which are weighed on scales adjoining the bridge support before and after they discharge their contents into the underground reservoir. They can do this while standing on the scales.

From these underground tanks the gasoline is forced by electrically driven centrifugal pumps through a self-cleaning filter. The piping system is so arranged that gasoline can be drawn from any one of the three under-



The company has five of these tank wagons for taking gasoline from the railroad tanks to the garage charging stations

ground tanks and can be pumped from any one of these tanks to any other. After leaving the filter the gasoline passes through a set of meters to the three sets of charging pipes. Each of these consists of two pipes, one of 40 mm. (1½ in.) diameter and one of half that diameter. The larger one is used until the tank on the bus is nearly full, then it is shut off and the pipe of smaller diameter is employed. There is a separate meter on each pipe to give more accurate measurement of the amount taken. With a flow capacity in each set of pipes of 135 liters (35½ gal.) a minute, a capacity of each bus tank of 100 liters (26½ gal.) and three sets of charging pipes it will be seen that buses can be charged easily at the rate of 30 seconds each. When the filling of a bus is completed the charging hose is hauled out of the way. In addition, there is a small tap on the supporting pillar of the bridge for use in drawing gasoline for miscellaneous or emergency purposes.

Thermometers are arranged both in the measuring room and on the bridge, so that if the gasoline reaches a temperature thought dangerous all pumping is automatically stopped and a warning given. At all places where there is a possibility of drip there are gutters to catch the gasoline and carry it to an underground chamber, where it is pumped by hand through a filter and saved.

The standard bus of the Berlin General Omnibus Company has two decks, usually with the upper deck inclosed, four wheels and solid tires. Operating expenses about the first of this year were 33.5 cents per bus-mile. One six-wheel bus has recently been built for trial. The company has five garages.

Kansas City's Track Rehabilitation Program

REHABILITATION of the Kansas City Public Service Company requires about 25 miles of track replacement and several new bridges. This work will necessitate the use of thousands of tons of rock, which the company has decided to mine itself. A shaft was sunk and new equipment has been installed which will produce 500 cu.yd. of rock daily. For transporting and handling materials, two Differential motor cars, five trailers and one derrick have been added.

With 120,600 ft. of single track to be completed within a year, the problem of excavating 374,999 cu.yd. of material was solved through the purchase of an Insley excavator. This machine will do the work of from 25 to 30 men and will effect considerable economy.

Another addition to the equipment is a 21E Rex paver, capable of laying 700 to 800 ft. of single track a day. This machine is equipped with automatic water control, batch meter and timing device.

To work in conjunction with the paver, two Haiss power loaders have been purchased. These machines are used for loading sand and rock. With this equipment six to eight men can handle all materials to the paver. The loaders are equipped with strike-off batch hoppers that insure a more consistent mixture and, hence, a better grade of concrete.

To break out old concrete ahead of the power excavator two large portable air compressors, capable of handling six paving breakers each, have been added to the new equipment. There are 315 miles of track in Kansas City and about one-twelfth of it will be torn up and replaced by modern tracks and new paving. The construction department has been reorganized to carry on this work, at a cost of approximately \$1,000,000. Much has been done to minimize the cost of track rehabilitation by the purchase of new modern machinery and equipment.

This trackwork is progressing at the rate of about 1 mile per week. All material purchased outside of Kansas City, such as rails, steel ties and accessories, are stocked ahead of requirements. However, the larger bulk of the material consists of sand, stone and cement.

The company's cement cars go to a mill at Bonner Springs, Kan., and haul the cement direct to the job on which it is to be used. The sand supply is handled in the same way.

The type of track construction selected is considered the most modern yet designed, consisting of International steel ties and 90-lb. rails imbedded in a solid slab of concrete 13½ in. thick. Only two kinds of material are used, steel and concrete. No ballast, wood ties, asphalt, granite or brick paving are used, as in other types of track construction. The type of track now being torn up consisted of wood ties on ballast, or in concrete, 7-in. rail, tie plates, screw spikes and granite paving. The cost of this type per lineal foot of track was about \$13, as compared with a cost of approximately \$8 a lineal foot of the new track. The difference in cost is due to various factors: First, the present type of construction calls for less excavation and still gives ample depth for the track structure; second, the section of rail adopted, although about the same weight as the old rail, costs much less per ton, being standard section; third, granite paving is very expensive and is not necessary for the present-day rubber-tired vehicles.

Designing Vehicles to Sell Rides

By J. H. Lucas

General Superintendent of Rolling Stock
The Milwaukee Electric Railway & Light Company

The following article is taken from an address before the Transportation Section of the Wisconsin Utilities Association at its summer meeting, held at Milwaukee on Aug. 18-19. All of the pictures were furnished by the author in illustration of the points he makes in the course of the address.

WITH Joliet, Ill., and Springfield, Mass., bringing out cars like buses and the automobile manufacturers producing buses resembling street cars, we can well afford to devote some time to the consideration of current trends and objectives. It is an encouraging sign for all of us to note the activity throughout the country in providing new equipment, new cars and new buses. And operators all make old equipment more comfortable and attractive. The private auto and the bus have brought new ideas into the transportation field and our car and bus equipment must keep pace or preferably do better.

The motor bus builders are good advertisers. Glance at one manufacturer's prospectus and see if it offers anything of value. "The ruggedly built body of the P.D.Q. bus will give years of service. The side panels are padded to prevent road noises and windows which slide in grooves of felt are non-rattling. This car is designed to provide superlative comfort. Deep lounging seats, wide aisles, unobstructed vision, adequate ventilation and quiet operation insure utmost comfort." "Abundant power and speed." "Special heavy duty rear axle and with special springs and balloon tires. This parlor car rides with rail-like smoothness." Note that!

They go on to say that "equipment is complete and includes front and rear bumpers, etc.—and on the dash, grouped under glass, artistically arranged and indirectly lighted, are the instruments—speedometer, ammeter, oil gage, gas gage, thermometer, eight-day clock, etc." "The long low lines of the body blend gracefully into the cowl and hood, and at the rear an ornamental grille work and awning accentuate the luxurious impression."

There's a whole barrellfull of ideas. As a matter of fact, the co-ordination of car and bus design has already made great progress. We have adopted bus ideas to rail car use, and while we can take more, the reverse is also true, i.e., bus designers have used and can use more rail experience and principles to advantage. Speed, comfort and attractiveness are stressed as of major importance in modern transportation vehicles.

In this day speed is primarily important, and we are finding that our electric railway has some advantages. For example, consider our own interurban lines running out of Milwaukee. When paralleling concrete roads



Development of Interurban Car Seats
and Interior Finish

At top, high back seats, 1922; center, sedan-type seats, improved lighting and finish, 1924; below, individual de luxe seats, 1926.

were laid a few years ago, the competitive buses were able to take their small load through traffic and into the country more quickly than the rail cars. By a change in route we were able to get onto our own right-of-way in ten minutes, eliminating a long drag through city streets. With motors geared up to 65 to 70 m.p.h., private autos and buses cannot equal our time and we are getting a healthy increase in the interurban business. This particular instance depended for success on other matters beside improved car design, and is a good example of the absolute necessity of doing everything to increase speed.

In city service, likewise, speed must be the first consideration of car and bus design. High acceleration rates are essential, and where $1\frac{1}{2}$ to $1\frac{3}{4}$ m.p.h. per second used

to be considered good, 3 m.p.h. per second is now thought desirable. This necessitates larger motor capacity or higher-speed motors with steeper gear ratios. The possibility of using 6 or 7 to 1 worm gears is one of the things that make the automotive type axle a possibility for car use.

The bus, too, must pro-



As a further aid to speed, we must consider the use of anti-friction bearings. Many of us tested anti-friction bearings under cars years ago, and past experience somewhat prejudiced our opinion. Roller bearings today are so much improved that they again merit consideration for the possibility of better acceleration, if for no other reason.



vide more power for pep and speed. The original four-cylinder engines furnished with the first buses were too small today. In fact, it is pretty generally realized that the six-cylinder bus costs no more to operate and gives better speed and comfort. Gas consumption with the six is practically the same as with the four in equal service, as gears are



Possibility of improvement in braking also must be given thought. With higher speeds for all vehicles we must specify the best possible brakes for safety. Various types of power brakes are being tried out on buses. Whether the automotive type of braking apparatus that is being tested under street cars is going to be an improvement over our old standard of cast-iron

Improving Body Lines of Interurban Cars

A single car of the old type is shown at the right. Immediately above is a similar car after rebuilding.



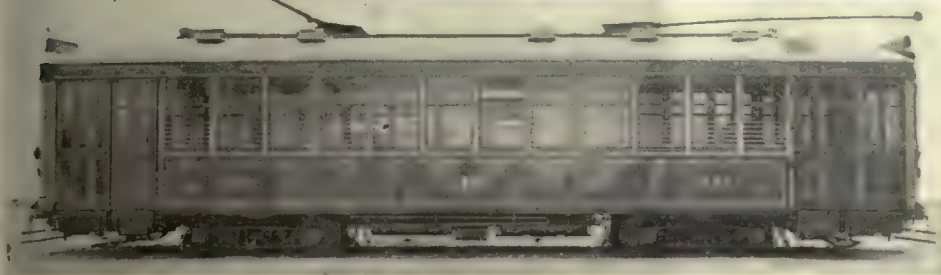
The views at the top show two-car trains of the old and new types, indicating how improved lines have been obtained.

shifted less frequently. Less gear shifting speeds schedules considerably in city operation, and the greater proportion of time operating in high gear provides more comfort for passengers. The latest product of the bus builders' art employs two motors per car to provide ample power for speed, thus copying electric car practice and further emphasizing the co-ordination in design.

shoes bearing directly on the wheels remains to be seen. It is significant to note that metal to metal brakes are being used to some extent on the buses.

When we consider comfort, we find that the bus and automobile have assisted in one of the outstanding improvements of recent cars, the change in seats. For years our best offering in a car seat used fairly stiff

springs and a reversible back, which was straight across and not at all form-fitting. The sedan bus brought the automobile seat and the so-called parlor bus the soft upholstered individual chair, which have proved a most popular addition to our interurban equipment. Nine out



Above—Streamline effect obtained through two-color paint scheme. At left—Old-style single color system of painting on the same series of cars

of ten passengers, asked concerning their impression of our interurban improvements, mention "those seats," so it is easy to know where to stand on the seating question.

It is out of the question and unnecessary to consider the use of this type of seats in city cars and buses, but for this short ride service the use of fabric or other upholstery than the old standard rattan has made some favorable impression. This may be a passing fad and really has more to do with appearance than comfort.

Other features contributing to comfort are light, heat and ventilation, the elimination of noise and improved riding qualities. The bus does not offer as much with respect to the first three as the rail car does and the relative advantage of noise and ease of carriage is open to question. Lighting is one of the cheapest items. We can well afford to have cars and buses well lighted, so that passengers can read in comfort and cars will appear attractive. Bus fixtures particularly need improvement. All parts of electrical apparatus on a bus are too small and flimsy and bus makers can co-ordinate to considerable advantage by using standard car wiring connections, etc., which admittedly would be oversize, but which would nevertheless give less trouble and failures in service.

Bus heating systems also must be improved if we are to maintain equal warmth for comfort in a bus as we have in cars. Steam and hot water heat for buses are experimental. We have in Milwaukee the first double-deck bus in the world to have heat in the upper story. This is steam heat. One advantage of steam is that you can use $\frac{1}{4}$ -in. copper tubing for body radiator connections and eliminate the large sized exhaust pipes from the floor and inside of the bus. Steam also minimizes the fire hazard.

Ventilation of buses can be improved by following interurban car practice and providing for positive inlet of fresh air. A great deal of complaint of car sickness and nausea can be avoided by proper ventilation in both car and bus.

Quietness and ease of riding are two qualities contributing to comfort that to a certain extent go hand in hand. For a time it was suggested that the automotive



An inclosed cabinet conceals controller and piping, making for a clean platform

vehicle had an inherent advantage because it rode on rubber tires, and we heard a lot of talk concerning the "rubber urge." Now, as in the advertisement quoted earlier, the bus is stressing operation "with rail-like smoothness." Noise is a sign of wasted energy and poor design. Rubber is an excellent absorber of sound, and if we cannot use it in our wheels we at least should employ it to deaden metal-to-metal contacts where annoying noise is produced. Rubber-cushioned wheels have not been successful because the space in which rubber can be inserted in a car wheel is too limited. If we ever come to a cushion wheel for rail cars it will be something other than rubber, possibly the old pressed-paper center wheel such as was used under Pullman cars years ago.

The bus, however, features rubber spring shackles and engine mountings. This points out some advantageous applications on cars. Rubber pads under center bearings have been used and the report on noise research presented before this convention last year indicated that this installation has accomplished something. Rubber washers at drawbar anchorages and rubber hose around



A modern bus that has been designed with street car appearance

brake rod supports quiet little knocks that are noticed and complained of by the passenger. Other sound-absorbing materials are available for eliminating noise, squeaks and rattles from bus and car and all such deserve consideration.

Reduction of noise is presumed to be an important feature of the automotive type axle with its worm gear as used under the Joliet and Springfield cars. We may not fancy this particular type of axle with its differential, but we cannot ignore the possibilities of the worm gear on this one count alone. We can get other types of worm gears to go on our standard axle, and from such experience as we have had in our buses, i.e., quiet operation and low maintenance, I would be inclined to try some if the cost were anywhere within reason.

Good roadway and track maintenance affects riding results and noise to a degree that is of equal importance to all that we can do in vehicle design. Up-to-date car trucks with ample wheelbase and proper spring proportions will please our passengers more than the older models can with the same track conditions, but any car rides poorly on rough track just as any bus or automobile does on a rough road. With increased speed, both tracks and trucks must be given more attention.

In a resolution adopted at the December meeting, the equipment committee of the A.E.R.E.A. recognized the need of more attractive rolling stock. This problem concerns not only the design and evolution of new rolling stock, but also includes the changing of existing cars and buses to modernize them and to increase the passenger sales value of the equipment. Competition cannot be met with cars that are the same today as twenty years ago. While all of the old cars cannot be scrapped, they can at least have a change in color of paint and it is surprising how much attention and favorable comment such a relatively small expenditure will bring.

The automotive people have learned to accentuate "streamline effects" with paint. We can undoubtedly use this thought in repainting cars as well as in new construction. Contrasting colors on upper and lower body panels with the judicious use of striping unquestionably adds to the appearance of any car and is much more pleasing than one solid color. I would not suggest consulting an artist when you pick a color scheme for rolling stock. Bright, attractive combinations of the reds, yellows and greens with cream or ivory are very

effective on a public conveyance, although they may jar the sensibilities of one who has been educated to values of the more refined tints and subdued shades. The bus builders have led in the adoption of lacquer finishes, and there is no doubt that this material has splendid wearing qualities on metal surfaces. Lacquer for wood may be developed, but there seem to be more possibilities in the adoption of metal covering for all exterior parts so that we can use the present materials. Metal doors and sash are being produced with this in view.

In the Springfield cars the body builders imitated bus design in the windshield effect of the motorman's window. Whether we need to go this far in co-ordinating design is again a question. Personally, I do not think that the automobile or bus with its engine hood sticking out in front is much better looking than our standard car. The "Twin Coach" adopts street car appearance and conceals its motors under the body to produce a fairly good looking job.

On the inside of the car, however, we can take a tip from the bus and arrange our control equipment more neatly. On older cars we have a mess of pipes, valves, a homely controller, door-operating shaft, fare box stands, etc., that collect dust and dirt, old newspapers and transfer punchings; overhead a miscellaneous array of switches and wires. On new equipment, it costs little more to specify simple cabinet inclosures for this equipment, which contribute substantially to good appearance and are easy to keep clean. If old cars are being converted for one-man operation, a little thought and money spent on this feature will be well worth while.

Soldiers Transported on Buses of Boston "El"

BUSES of the Boston Elevated Railway carried nearly 1,500 men to Camp Devens for their summer encampment on July 9. Fifty-nine buses, each containing approximately 25 men, with their equipment, were mobilized in four groups for this purpose.

Two state constabulary officers on motorcycles went with each group, one leading and setting the pace at about 20 miles per hour, the other guarding the rear from interference. The "L" furnished nearly one-half of all the buses engaged in this troop movement, the total involved being about 125.

Readers' Forum

Methods of Improving Quality of Rails

WILKINSBURG, PA., Aug. 23, 1927.

To the Editor:

Efforts to secure a quality of rail that will have longer life have been made principally in two directions. One has been the use of increasingly harder steels; i.e., of higher carbon content, ranging up to about 1 per cent. The result, however, has been disappointing. While a steel of such high carbon content is much harder than mild or semi-mild steel, it is also much more brittle and considerably greater care as to quality becomes necessary. The use of alloy steels has not as yet met with any degree of success. If they are used simply in the "as rolled" condition nickel or nickel-chromium steels offer little advantage over straight carbon steels. Manganese steel shows exceptional resistance to wear and proves successful in rail junctions and crossings, but it is too costly for use as ordinary rails.

The second line of effort for the improvement of rails has been an attempt to secure perfectly sound and homogeneous steel free from blowholes, non-metallic material and segregation. For trial purposes special rails have been ordered to stringent specifications in regard to homogeneity. The production of steel to meet such requirements, however, entails so wide a departure from ordinary rail production practice that the cost becomes excessive. The desirability of "sound steel" for rails from the point of view of safety cannot be denied, and it is a problem to be faced by the steel maker how to produce a better quality of steel, more suited to modern requirements of speeds and loads, without an excessive increase in cost.

Meanwhile, a third method of improving rail quality is receiving increasing attention, viz., the application of heat treatment. This is by no means a novel idea, as it was suggested and tried many years ago. The great advantage to be gained by the use of heat treatment is that it is possible to combine considerable surface hardness with great toughness and considerable ductility in the body of the rail and to use a steel of medium carbon content. There is, however, a serious consideration which may, perhaps, account for the limited employment of the heat-treated rail. No amount of heat treatment can get rid of the defects and dangers associated with unsoft steel; in fact, it is more than doubtful whether it is wise to apply such treatment to steel which is segregated, contaminated with non-metallic inclusions or interspersed with blowholes. Indeed, since internal defects are likely to cause cracking during quenching operation, the heat treatment of steel of relatively low grade may do more harm than good.

The application of heat treatment to rail steel has again been taken up in France at the Neuve-Maisons works of the Compagnie des Forges de Chatillon. Like previous heat-treatment processes applied to rails, the aim is to harden and temper the steel of the head only, by a partial quenching, which leaves the heat from the rest of the rail, flowing into the head after quenching, to effect the right degree of tempering. The novel feature of the method employed at the French works is the way the quenching of the head is carried out. For this purpose the hot rail is pushed into a long frame, in which it is held head down over the long quenching bath. The quenching process consists in making the quenching

water come into contact with the rail head for a brief period several times in succession. In order to regulate the severity of the quenching effect a limited amount of water is used, so that the quenching water rapidly comes to the boil. Boiling water has very little quenching effect, and by this means an almost automatic compensation is brought about for differences in the temperatures of successive rails as they are brought to treatment. The hotter rail raises the quenching water to the boiling point more rapidly and thus compensates for what would otherwise be a more severe quenching effect.

There can be no doubt that carefully controlled heat treatment of this kind must produce markedly beneficial results on rails made of medium hard steel of good quality. Hardness and abrasion tests carried out at the French works speak strongly in favor of the heat-treated material, as is to be expected. Whether or not the treatment will justify itself in practice remains to be seen. As suggested above, it must depend to a very large extent upon the general quality of the steel to which the process is applied. Although good steel can be markedly improved by the right heat treatment, the best of heat treatment cannot cure an unsound steel.

JAMES SILBERSTEIN,
Metallurgical Engineer.

Push the Button and Learn the Shortest Route



Intending passengers on London tramways can learn by pushing a button the route to take to any desired point

DEVICES known as "pathfinders" have been installed by the London County Council Tramways at two or three important traffic points on its system. The device consists of a large map of the L. C. C. tramway lines, supported vertically in a frame with a row of some 40 push buttons on each side. Opposite each push button is the name of an important traffic point on the system, with the number of the car route which a passenger must take from the location of the "pathfinder" to reach that point.

If any intending passenger wishes to know the direction and streets covered by that route, he has only to push the button opposite his desired destination. This lights a row of miniature electric lights behind the map, showing the route to be followed.

The accompanying illustration shows one of these "pathfinders" of the L. C. C. tramways at its Westminster Bridge waiting station. An intending passenger is shown in the act of pushing a button.

Maintenance Methods *and* Devices

Canvas Hose Run Through Vat and Wringer

INSULATING compound is applied to the canvas hose used in covering conductor cables on cars of the Dallas Railway & Terminal Company, Dallas, Tex., by a home-made vat, clothes wringer and winding reel. This small but important piece of apparatus is mounted on one of the roof-supporting posts of the

pulley operated from the crankshaft of the wringer. In operation, the hose is laid out on the floor in line with the apparatus. It is fed through the lower sheave and up through the wringer rollers. The vat is filled with the insulating compound and the end of the hose is then carried up and attached to the winding reel. It is only necessary then for the operator to turn the crank of the wringer and the entire length of hose is treated without further attention.



Apparatus used in the shop of the Dallas Railway & Terminal Company for treating canvas hose used in protecting cables mounted in cars. It consists of an abbreviated clothes wringer, reel and vat. Ten minutes are required to treat a 100-ft. length

shop. Its use enables the coating of 100-ft. lengths of the 2-in. diameter canvas hose in a little less than ten minutes. It replaces the former process of painting with the canvas stretched out on the floor. The vat is "V"-shaped, of sufficient width to accommodate the hose. A sheave at the bottom of the tank guides the hose through the insulating compound, while an abbreviated clothes wringer at the top serves not only to pull the hose through the tank but also to squeeze out excess compound and thoroughly to impregnate the fabric. A reel mounted above the vat is driven positively by a spring belt and

Spray and Dip Painting in London

SPRAY and dip painting are used extensively by the electric railway and bus companies in London, England. In the shops of the London County Council Tramways several rooms, one of which is illustrated, have been partitioned off for spray painting with good facilities for exhausting the waste paint vapors. Temporary partitions are used at present, but later it is expected that permanent rooms for spray painting will be provided.

The room is lighted by two rows of lamps on each side. Each wall has sockets for holding the brackets of the painters' scaffolding. In the view published a row of such brackets are shown above the first cross girder, so that the scaffolding



Spray painting of cars on the London County Council system is done in individual chambers provided with steam heating and exhaust systems

can be used for painting the upper deck of the car. Steam heat is used to assist the drying process and the room is well ventilated from above as well as by exhaust pipes which extend down the walls on each side. Cars are both painted and varnished by the spray process in this room, which is long enough to hold several cars. It is the company's practice once a year to give each car a coat of color and one of varnish. The old paint is rubbed down but not burned off.

The system has several small chambers, 4 ft. high and 4 ft. to 6 ft. wide for spray painting small parts. They look somewhat like dry goods boxes with the front end open. The rear of each of these boxes is fitted



Car parts in London suitable for one color jobs are dipped into paint tanks. Varnish is also applied in the same way

with an exhaust pipe for removing the fumes used spray.

All car parts which can be finished in one color are dip painted rather than sprayed. This applied to parts like life guards, floor mats, long lining boards and gear cases, which, on the London County Council Tramways, are of wood. Some of the dip tanks used for this purpose are 20 ft. or more in length to accommodate the longer pieces. Those parts which need a coat of varnish later are dipped in similar varnish tanks after their paint has dried. A view of one of the dipping rooms is given in the second illustration.

Many a car's downfall is the result of a poor overhaul.

Convenient Method of Carrying Welding Equipment

By M. SPITZ

Gary & Southern Traction Company,
Crown Point, Ind.

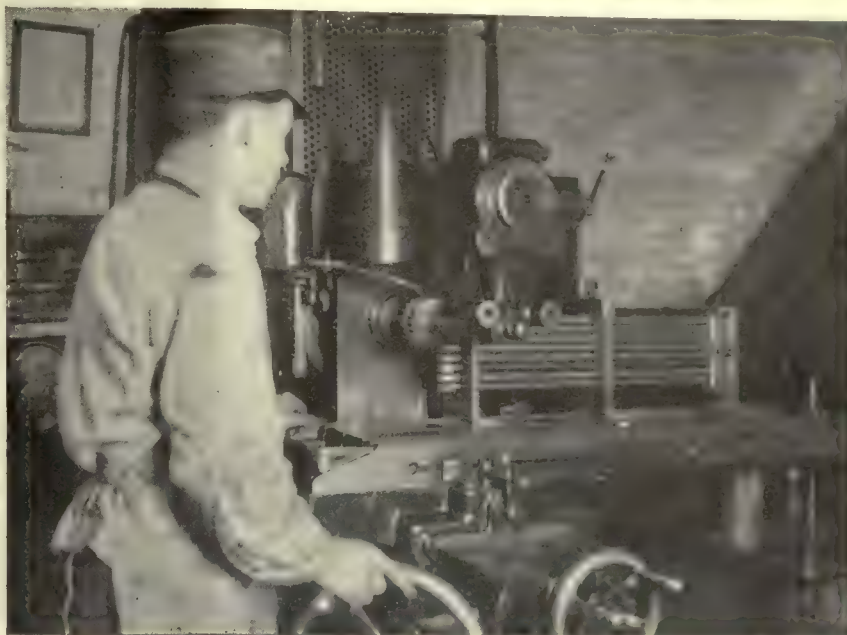
EQUIPMENT for bond welding is carried on a motor car by the Gary & Southern Traction Company, Crown Point, Ind. The welder is connected to the trolley base of the



Method of carrying and connecting welding equipment on a car of the Gary & Southern Traction Company

car, so a separate pole is not needed to connect the welder to the trolley wire. This speeds up the work so that in eight hours 224 bonds were welded to the rail. A total of 2,200 Una bonds have been welded in this manner in a short interval.

Fixture for Milling Square Ends on Rods



Convenient fixture for milling the square ends on elevated gate bars

GATE bars for the elevated cars of the Brooklyn - Manhattan Transit Corporation, Brooklyn, N. Y., are square at both ends. The faces of the square portion must be in the same plane for the two ends of the bar. In order to provide for accurate work in making these bars and also to provide for milling a quantity of them at one time a fixture shown in the accompanying illustration is used.

The fixture consists of three up-rights which are fastened to the table of the milling machine and which provide for clamping eight bars. When the squares at one end are milled, these fit into a plate with square holes at the opposite end of the fixture so as to hold the surfaces in alignment while the other ends of the bars are milled. Accurate alignment of the faces results.

Monthly Contest Still Open

EYES of all contestants in ELECTRIC RAILWAY JOURNAL'S Maintenance Competition are now turned toward the Convention Issue, which will be published on Sept. 17 and will contain an announcement of the winners of the Capital Prizes and the August monthly winner. The winning articles will be published also. The material received has been of such a valuable nature that it has been decided to add a fourth capital prize to the other three for the maintenance article that receives honorable mention by the judges. The list of capital prizes now is: first, \$200; second, \$100, third, \$50, and honorable mention, \$25.

CONTEST STILL RUNNING

Competition for the monthly prizes of \$25 each still continues and many additional articles are being received. Each of the articles received up to April 30, 1928, will have a chance of winning one of the monthly prizes

and, in addition, \$5 will be paid for each item published whether it receives a prize or not.

CONTEST CONDITIONS

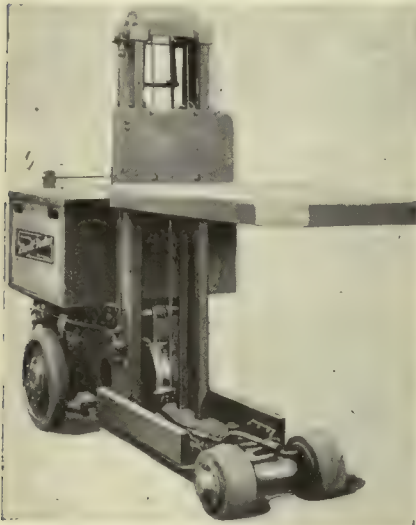
1. Any employee of an electric railway or bus subsidiary may compete.
2. The author does not need to be the originator of the idea.
3. Articles may be submitted by several persons or by a department.
4. Any maintenance practice or device for electric railway or bus repairs may be the subject.
5. Articles should be 100 to 200 words long with one illustration, and in no event longer than 400 words with two illustrations.
6. Manuscripts should be mailed to the editor of ELECTRIC RAILWAY JOURNAL, Tenth Avenue at 36th Street, New York, N.Y. To be eligible for the monthly prizes manuscripts will be received until April 30, 1928.
7. Illustration material may be in the form of drawings, sketches, blueprints or photographs. All sheets should be marked "Maintenance Competition."
8. Details of the conditions not given will be found in ELECTRIC RAILWAY JOURNAL for April 16, pages 700-701.

New Equipment Available

Light-Duty Elevating Platform Truck

HANDLING of skid loads or delivering and receiving goods to motor trucks or electric cars is the purpose of a new light-duty electric tiering truck added to the line being marketed by the Elwell-Parker Electric Company, Cleveland, Ohio. It will elevate a load from the floor to a maximum height of 8 ft.

The truck is of all-steel construction and is built on the interchangeable parts basis. The power plant is



New type elevating platform electric truck

of unit type, which includes an Elwell-Parker motor, steel brake drum, steel multi-thread Brown & Sharpe worm, chrome-vanadium drive shafts and universal joints to permit steering and the delivery of power to the steel clutch plates bolted to the outside of the drive wheels. Solid rubber tires are provided.

The operator's pedals, one for brake and the other for controller reverse drum, trip to off position when the pedal is raised and are provided with a heel rest with a non-slip surface. The pedals are spring folded when the operator leaves the truck. The braking and power are actuated separately to provide for incline operation.

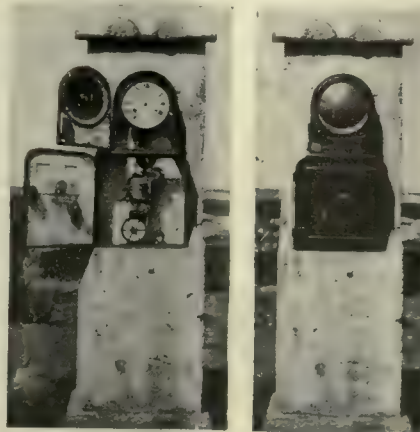
The platform is a solid plate of steel with edges bent to form a deep skirt and with heavy angles welded down the middle for attachment to steel support arms. Each arm carries two long rollers which bear on heavy section channel uprights fitted with a track.

The main frame is built of angles, channels and heavy gusset plates. The battery compartment, with removable sides, will accommodate practically any size battery the service may require, and still the truck is narrow enough and short enough to turn in narrow aisles. The steering mechanism is of the ball-and-socket type. This machine is a high-speed tool and is built with various height lifts and several sizes of platforms.

Rome Headway Recorder

TWELVE headway recorders of the type shown in the accompanying illustrations are in use on the Rome Municipal Tramways. They were designed by Romolo Remotti, superintendent of transportation of the system. One of these recorders was put in service about two years ago and proved so satisfactory that eleven others have been installed during the past twelve months. They are operated by the motorman or conductor.

When a car reaches a recorder, the operator stops, inserts a key, turns it first in one keyhole and then in another, then returns to the car. This takes less than twenty seconds and leaves a record of the time and of the key number. So as not to delay the service, the recorders are placed at points where a stop of at least twenty seconds would be made in any event, as at a terminus or at a near-by street intersection. They are not used in the center of the city, but it is believed as good results are secured as if recorders were also in the busy sections. Even when at or near a terminal, registrations are made on both the inbound and outbound trips.



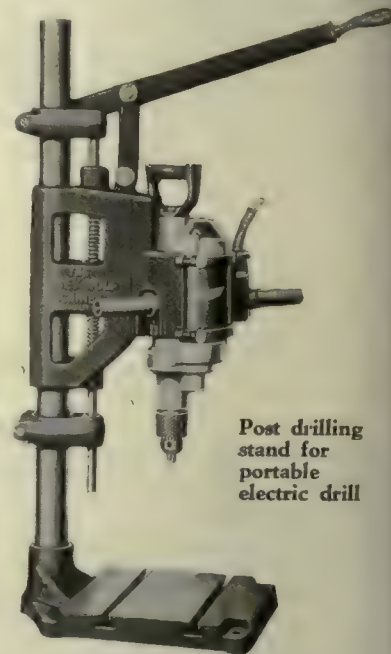
This headway recorder is used in Rome; at left, open; at right, closed

The purpose of the two keyholes mentioned is to prevent dust and other foreign bodies from getting into the working part of the recorder.

When the registrations from this recorder are tabulated or plotted they clearly indicate any irregularities in the running time.

Stands for Electric Drills

FOR post, wall or bench mounting a line of new stands for Hisey electric drills has been designed by the Hisey-Wolf Machine Company, Cincinnati, Ohio. These stands are made for sizes of electric drills from $\frac{1}{4}$ in. to $\frac{7}{8}$ in. capacity and are designed



Post drilling stand for portable electric drill

so that the portable drills can be attached without removing parts of the machine. The supporting bracket and electric drill housing are machined accurately on each end to insure perfect alignment of the drill in the stand.

Improved Aluminum Arrester

VOLTAGE per cell has been reduced, thus affording longer life, in an improved lightning arrester introduced by the General Electric Company for direct-current railway service. The new type of cells, with balancing resistances direct connected, can be substituted easily in the boxes in place of units now in service. Although these improved arresters have just been put on the market, they have been tested thoroughly on railway properties operating in localities where lightning conditions are unusually severe.

American Association News

Convention Program Shows Many Changes from Last Year

Round table luncheon conferences for executives, group meetings for the engineers, and additional time for inspection of exhibits, among the features

MANY changes have been made in the arrangements for the 46th annual convention of the American Electric Railway Association, to be held in Cleveland, Ohio, from Oct. 1 to Oct. 7. The program, just released by the association, shows that much thought has been put on the problem of getting the greatest value out of the time at the disposal of the delegates.

The exhibits will open at noon of Saturday, Oct. 1. As in previous years meetings of the American Association will be held in the mornings and those of the affiliated associations in the afternoons on Monday, Tuesday and Thursday, Oct. 3, 4 and 6. Wednesday will be set aside for inspection of the exhibits, as has been the practice for the past two years. A new feature this year will be the conference luncheons on specific topics, which have been referred to in previous issues of this paper.

Meetings of the American Association and those of the Transportation & Traffic Association will be held in the Auditorium Annex. This is the same

room in which these associations held their meetings last year. The Tuesday evening meeting under the auspices of the Advisory Council will be held in the main ball room on the Arena floor of the Auditorium. Meetings of the Engineering Association, the Accountants' Association and the Claims Association will be held in newly arranged rooms in the lower floor of the Auditorium building. The Tuesday sessions of the Engineering Association will be held in four groups, the principal subjects being Way and Structures, Rolling Stock, Purchases and Stores, and Power. There will be a joint meeting of the Claims Association and the Transportation & Traffic Association on Tuesday afternoon. The round table luncheon conferences will be held in private dining rooms of the local hotels, those on Tuesday being at the Hotel Hollenden and those on Wednesday at the Hotel Cleveland. The larger conference scheduled for Thursday will be held at the Hotel Statler.

The complete program, revised to Sept. 2, follows:

AMERICAN ASSOCIATION

Monday Morning, Oct. 3

WELCOME—W. R. Hopkins, City Manager, City of Cleveland.

PRESIDENT'S ADDRESS.

COMMITTEE REPORTS.

ADDRESS—Dr. A. H. Wishart, pastor First Baptist Church, Grand Rapids, Mich.; a talk on what the public expects and how the railways can please.

ADDRESS—Dr. Miller McClintock, head of The Albert Russell Erkin Bureau for Street Traffic Research, Harvard University; a talk on street traffic control and electric railway operation.

Tuesday Morning, Oct. 4

REPORT OF COMMITTEE ON NOMINATIONS—J. N. Shannahan, chairman.

ELECTION OF OFFICERS.

ADDRESS—M. H. Aylesworth, president National Broadcasting Company, New York; a talk on leadership in the utility field.

ADDRESS—George E. Frazer, Frazer & Torbet, certified public accountants, Chicago; a talk on financial structure.

ADDRESS—Merle Thorpe, editor *The Nation's Business*, Washington, D. C.; a discussion of the manifold contacts of the federal government with business.

ADDRESS—Hon. Wm. W. Potter, attorney general of the state of Michigan; some observations on commission regulation.

REPORT OF COMMITTEE ON CONSTITUTION AND BY-LAWS—C. D. Emmons, chairman.

Round Table Luncheon Conferences, Hotel Hollenden, 1 to 2.30 P.M.

No. 1. Traffic Regulation—H. B. Flow-ers, sponsor.

No. 2. Taxes—Leslie Vickers, sponsor.

No. 3. The Motor Bus—L. H. Palmer, sponsor.

No. 4. The Trend in Franchises—L. R. Nash, sponsor.

No. 5. Developing Sales Instinct in Platform Employees—G. H. Clifford, sponsor.

No. 6. Advertising—to Increase Riding; to Improve Public Relations.

Tuesday Evening, Oct. 4

ADVISORY COUNCIL NIGHT—B. C. Cobb, chairman of Advisory Council, presiding.

CLEVELAND MALE CHORUS.

ADDRESS—B. C. Cobb, New York.

SOLO—Miss Anna Case of the Metropolitan Opera Company.

ADDRESS—Hon. George B. Cortelyou, president Consolidated Gas Company, New York, and chairman Joint Committee of National Utility Associations.

SOLO—Miss Anna Case.

PRESENTATION OF CHARLES A. COFFIN FOUNDATION AWARD.

SOLO—Miss Anna Case.

DANCING UNTIL 1 A.M.

Wednesday, Oct. 5

EXHIBIT INSPECTION DAY. There will be no formal sessions.

Round Table Luncheon Conferences, Hotel Cleveland, 1 to 2.30 P.M.

No. 7. Cars—What Is Being Done and Results—L. J. DeLamar, sponsor.

No. 8. The Problem of Financing.

No. 9. Public Relations—T. Fitzgerald, sponsor.

No. 10. Bringing City Service Up to Date.

No. 11. The Valuation Question—Walter A. Draper, sponsor.

No. 12. Trend of Fares—F. W. Doolittle, sponsor.

No. 13. Employee Relations—Britton I. Budd, sponsor.

Thursday Morning, Oct. 6

ADDRESS—E. F. Wickwire, chairman committee on co-operation of manufacturers.

SYMPOSIUM—"How the Industry is Progressing." Five-minute talks by operating executives relating the feature accomplishments of the year on properties in different parts of the country. Questions which will be asked and answered are as follows:

Does aggressive property-wide rehabilitation pay?

How are you arranging service and publicity to secure an additional passenger per car mile?

How have you reduced pull-ins to one in 600,000 miles and how have you reduced equipment maintenance costs to 2 cents per car mile?

How have you reduced overhead line breaks to one in 58 days?

What are the facts about your ability to operate at same cost per mile as prior to the war?

How have you inspired platform men with greater interest in their jobs?

With very low population per mile of track, how have you made your system pay?

How have you sold the public on the railway?

How have you robbed the junk man of your interurban and made it a profitable property?

How are you meeting the transportation needs of your community?

How have you made a 300 per cent increase in revenue?

How did you change an unprofitable bus operation to a highly profitable one?

What has been your experience with deluxe service in a large city?

ADDRESS—Francis H. Sisson, vice-president Guaranty Trust Company, New York; a discussion of factors that affect the market for electric railway securities.

INSTALLATION OF OFFICERS.

Round Table Luncheon Conference, Hotel Statler, 1 P.M.

No. 14. Opportunities and Prospects for the Interurban. Dr. Thomas Conway, Jr., sponsor.

REPORT OF JOINT COMMITTEE ON TRAFFIC AND SAFETY—H. K. Bennett and C. H. Evenson, co-chairmen.

PREPARED DISCUSSION.

GENERAL DISCUSSION.

REPORT OF COMMITTEE ON BONUS AND AWARD SYSTEMS—G. T. Hellmuth, chairman.

PREPARED DISCUSSION.

GENERAL DISCUSSION.

ADDRESS—"Work of National Safety Council"—James P. Barnes president, Louisville Railway, Louisville, Ky.

GENERAL DISCUSSION.

ACCOUNTANTS' ASSOCIATION

Monday Afternoon, Oct. 3

ADDRESS OF PRESIDENT.

REPORT OF EXECUTIVE COMMITTEE.

REPORT OF SECRETARY-TREASURER.

APPOINTMENT OF COMMITTEE ON NOMINATIONS.

REPORT OF COMMITTEE REPRESENTING THE ACCOUNTANTS' ASSOCIATION AT THE ANNUAL CONVENTION OF THE NATIONAL ASSOCIATION OF RAILROAD AND UTILITIES COMMISSIONERS—W. L. Davis, auditor Lehigh Valley Transit Company, Allentown, Pa., chairman.

Discussion.

REPORT OF COMMITTEE ON BUS ACCOUNTING—M. W. Glover, general auditor West Penn Railways, Pittsburgh, Pa., chairman.

Discussion.

REPORT OF THE COMMITTEE ON STANDARD CLASSIFICATION OF ACCOUNTS—M. W. Glover, general auditor West Penn Railways, Pittsburgh, Pa., chairman.

Discussion.

PAPER—"Public Service Regulation—Effect on Accounting Practice"—Harry Boggs, certified accountant, Indianapolis, Ind.

Discussion.

Tuesday Afternoon, Oct. 4

REPORT OF COMMITTEE TO REVIEW THE PROCEEDINGS OF THE ACCOUNTANTS' ASSOCIATION—J. E. Heberle, assistant to the president Capital Traction Company, Washington, D. C., chairman.

Discussion.

REPORT OF THE COMMITTEE ON FARE COLLECTION—E. A. Tuson, general

auditor Public Service Railway, Newark, N. J., chairman.

Discussion.

PAPER—"Combating the Present Day Criminal." This talk will deal especially with conditions as they exist in street railway auditing departments. W. L. Barnhardt, resident vice-president National Surety Company, New York.

Discussion.

Wednesday, Oct. 5

EXHIBIT DAY—There will be no formal meeting except that a get-together luncheon at 12:30 p.m. will be arranged. The details of this will be announced later.

Thursday, Oct. 6

REPORT OF THE COMMITTEE ON GRAPHS—C. R. Mahan, comptroller Chicago, North Shore & Milwaukee Railroad, Highwood, Ill., chairman.

Discussion.

REPORT OF THE COMMITTEE ON STORES ACCOUNTING—R. A. Weston, special accountant The Connecticut Company, New Haven, Conn., chairman.

Discussion.

PAPER—"Passenger Revenue Auditing and Accounting"—Horace L. Howell, Meyer & Wenthe, Chicago, Ill.

Discussion.

REPORT OF COMMITTEE ON NOMINATIONS.

ELECTION OF OFFICERS.

INSTALLATION OF OFFICERS.

PRESENTATION OF PAST-PRESIDENT'S BADGE.

INFORMAL ROUND TABLE OF ACCOUNTING MATTERS.

CLAIMS ASSOCIATION

Monday Afternoon, Oct. 3

PAPER—"Proposed Uniform Traffic Regulation.—Its Advantages, including the ability of the Hoover Conference Recommendation."—R. A. Sears, general claims attorney, Boston Elevated Railway.

PREPARED DISCUSSION BY

J. J. K. Caskey, supervisor of claims Philadelphia Rapid Transit Company.

Frank J. Gatrell, general claim agent Chicago Surface Lines.

Discussion by a traffic officer on "Advantages of National Uniformity in Traffic Rules."

GENERAL DISCUSSION.

Tuesday Afternoon, Oct. 4

JOINT SESSION WITH TRANSPORTATION AND TRAFFIC ASSOCIATION.

Wednesday, Oct. 5

No formal meetings to be held on this day, which has been set aside for inspection of exhibits. An informal luncheon meeting, however, of Claims men has been arranged. At this meeting "Uncle Red," well-known safety engineer, will give one of his characteristic radio talks.

ROUND TABLE DISCUSSION.

Thursday Afternoon, Oct. 6

SYMPOSIUM ON CLAIMS SUBJECTS:

P. W. Klabunde, acting claim agent Milwaukee Electric Railway & Light Company, J. C. de Sautels, acting general claim agent Montreal Tramways.

Walter Robinson, claim agent Cincinnati Street Railway.

Bert C. Wood, general claim agent Pennsylvania-Ohio Electric Company, Youngstown, Ohio.

Augustus Baker, adjustment department Pittsburgh Railways.

D. A. Finkbeiner, claims attorney Community Traction Company, Toledo, Ohio.

J. W. Giltner, general claim agent Northern Ohio Power & Light Company, Akron, Ohio.

REPORT OF MEDICAL AND SURGICAL COMMITTEE—Dr. W. M. Holtz, Pittsburgh Railways.

PAPER—"The Claimant's Doctor—How May He Be Convinced of the Company's Fairness, and How May the Company Maintain His Friendly Cooperation?"—Dr. Hart E. Fisher, chief surgeon Chicago Rapid Transit Company.

PAPER—"Should the Company Doctor Attend the Injured Claimant?"—Ernest W. Miller, M.D., Milwaukee, Wis.

PAPER—"Should All Accidents Have Medical Investigation and if so, What Information Is Helpful to the Adjuster?"—H. M. Bascom, M.D., Illinois Power & Light Corporation.

PAPER—"The Company Doctor and Litigation"—Value of his examination prior to and his testimony at time of trial—Benjamin E. Sibley, M.D., Boston Elevated Railway.

PAPER—"The Company Doctor and Litigation"—How can he help to nullify the unfavorable effect of the professional medical witness?—John A. Leeming, M.D., Medical Counsel, Chicago Surface Lines.

OPEN FORUM—One-half hour for discussion of any medical problems that may be presented from the floor.

GENERAL DISCUSSION.

ENGINEERING ASSOCIATION

Monday Afternoon, Oct. 3

GENERAL MEETING

ADDRESS OF THE PRESIDENT.

REPORT OF THE EXECUTIVE COMMITTEE.

REPORT OF THE SECRETARY-TREASURER.

REPORT OF COMMITTEE ON NOMINATIONS.

ELECTION OF OFFICERS.

PAPER—"Track Construction and Maintenance Economies"—F. B. Walker, chief engineer, Eastern Massachusetts Street Railway.

PREPARED DISCUSSIONS—Five minutes each.

GENERAL DISCUSSION.

PAPER—"Economies Obtained with Modern Cars"—W. R. McRae, superintendent rolling steel stock and shops, Toronto Transportation Commission.

PREPARED DISCUSSION—Five minutes each.

GENERAL DISCUSSION.

PAPER—"Automatic Substation economies."

PREPARED DISCUSSION—Five minutes each.

GENERAL DISCUSSION.

Tuesday Afternoon, Oct. 4

WAY AND STRUCTURES DIVISION

H. H. George, Chairman, Presiding
W. W. Wysor, SponsorREPORT OF STANDING COMMITTEE ON WAY AND STRUCTURES—H. H. George.
Review of Manual—W. R. Dunham, Jr.
Special Trackwork—E. M. T. Ryder.
Arc Welding Processes and Welding Rod Specification—C. F. Gailor.

Alloy Steels Other Than Managanes for Special Trackwork—A. T. Spencer.

Light Section Girder Rails—C. A. Alden.

Rail Corrugation—W. W. Wysor.

Relative Advantages of 7-In. and 9-In. Girder Rails—H. F. Merker.

Effect of Modern Vehicular Traffic on Paving in Track Area—A. E. Harvey.

Bus Garage Design—R. McKay.

Track Ballast and Drainage—S. C. Baker.

Track Checking Gage—C. H. Clark.

Car House and Shop Construction and Wiring Regulations—H. E. Bachman.

Track Construction Specifications—C. L. Hawkins.

Joint Railway and Bus Terminals.

REPORT OF WOOD PRESERVATION COMMITTEE.—C. A. Smith.

REPORT OF WELDED RAIL JOINT COMMITTEE.—E. M. T. Ryder.

ROLLING STOCK DIVISION

A. T. Clark, Chairman, Presiding
P. V. C. See, Sponsor

REPORT OF ROLLING STOCK COMMITTEE—A. T. Clark.

Review of Manual—C. W. Squier.

Motor Coach Design—V. W. Berry.

Modern Cars—H. S. Williams.

Car Lighting—R. W. Cost.
Roller Bearings—W. C. Bolt.
Lubrication—W. G. Stuck.
Suction Strainers for Air Compressors—J. C. McCune.

Motor Brushes—Side Wear.

Noise Reduction in Car Operation—H. S. Williams.

Gearing—F. J. Foote.

Current Collecting Devices—H. Savage.

Journal Boxes—W. B. Adams.

Limits of Wear—J. M. Bosenbury.

REPORT OF COMMITTEE ON UNIFICATION OF CAR DESIGN—H. H. Adams.

REPORT OF COMMITTEE ON HEAVY ELECTRIC TRACTION—H. F. Brown.

PURCHASES AND STORES DIVISION

J. Fleming, Chairman, Presiding

ADDRESS—Daniel Durie.

ADDRESS—J. G. Barry.

ADDRESS—B. J. Yungbluth.

REPORT OF COMMITTEE ON PURCHASES AND STORES.

Manual Review.

Unused Inactive Materials.

Practices in Testing.

PAPER—"Some Phases of Stores Practice"—W. E. Scott.

POWER DIVISION

F. McVittie and W. E. Bryan, Presiding
L. D. Bale and C. H. Jones, Sponsors

REPORT OF COMMITTEE ON POWER TRANSMISSION AND DISTRIBUTION—F. McVittie.

Manual Review.

Catenary Construction and Materials.

Trolley Wire Wear.

Trolley Wire Specifications.

Radio Interference.

Trolley Wire Reels.

Distribution Layout for Automatic Substations.

Standards for Comparison of Operating and Maintenance Results.

REPORT OF COMMITTEE ON POWER GENERATION AND CONVERSION—W. E. Bryan.

Manual Review—C. W. Saathoff.

Ventilation of Substations—F. W. Peters.

Mercury Arc Power Rectifiers—G. I. Wright.

Economical Trolley Potential for Congested Areas—R. L. Weber.

Thursday Afternoon, Oct. 6

GENERAL MEETING

PAPER—"Trends in Motor Coach Engineering."

PREPARED DISCUSSION—Five minutes each.

GENERAL DISCUSSION.

PAPER—"Maintenance of a Large Overhead System"—M. W. Cooke, superintendent power and incline, Pittsburgh Railways.

PREPARED DISCUSSION—Five minutes each.

GENERAL DISCUSSION.

PAPER—"General Aspect of Commercial Aviation"—R. H. Horton, former vice-president, Philadelphia Rapid Transit Air Service and formerly director air transport survey of the Department of Commerce, Washington, D. C.

GENERAL DISCUSSION.

INSTALLATION OF OFFICERS.

PRESENTATION OF PAST-PRESIDENT'S BADGE.

NEW BUSINESS.

TRANSPORTATION AND TRAFFIC ASSOCIATION

Monday Afternoon, Oct. 3

ADDRESS OF PRESIDENT.

REPORT OF EXECUTIVE COMMITTEE.

REPORT OF SECRETARY-TREASURER.

APPOINTMENT OF CONVENTION COMMITTEE ON RESOLUTIONS.

REPORT OF COMMITTEE ON NOMINATIONS.

ELECTION OF OFFICERS.

REPORT OF COMMITTEE ON BUS OPERATION—R. N. Graham, chairman.

Discussion.

BUS OPERATORS' SCHOOL—A demonstration of the school of the Northern Ohio Power & Light Company for the training of operators.

Discussion.

Tuesday Afternoon, Oct. 4

JOINT MEETING WITH CLAIMS ASSOCIATION

REPORT OF JOINT COMMITTEE ON

TRAFFIC AND SAFETY—C. H. Evenson and H. K. Bennett, co-chairmen.

REPORT OF COMMITTEE ON BONUS AND AWARD SYSTEMS—G. T. Hellmuth chairman.

ADDRESS—"Work of the National Safety Council"—James P. Barnes, president Louisville Railway.

Wednesday Afternoon, Oct. 5

Wednesday being given over to inspection of the exhibits, there will be no meetings.

Thursday Afternoon, Oct. 6

REPORT OF COMMITTEE ON SERVICE BETTERMENT.

Discussion.

REPORT OF COMMITTEE ON RESOLUTIONS.

INSTALLATION OF OFFICERS.

PRESENTATION OF PAST-PRESIDENT'S BADGE.

American Executive Committee Urges Car Exhibit

STRONG appeal for a representative car exhibit was made by the American Electric Railway Association executive committee in a meeting held in the office of J. H. Alexander, president Cleveland Railway, on Aug. 26. This appeal was made following a report by the exhibit committee that track reservations for car exhibits this year by both manufacturers and operators so far total 25, with only comparatively small track reservations made by some of the large car builders. President W. H. Sawyer declared that the selection of Cleveland as the site for this year's convention had been dictated primarily by the need on the part of the industry for a representative car exhibit which would help to stimulate development in design, and the improvement of electric railway service. An exhibit of cars on a scale large enough to furnish further stimulus toward improvement of design and the replacement of obsolete equipment was held by the president to be of primary importance to the welfare of the industry. Each member of the executive committee was urged to do everything in his power to aid in bringing about a car exhibit that would equal or exceed that of last year, particularly as regards improvement and development shown. Such an exhibit, insisted the president, is of vital importance to the welfare and progress of the industry.

Those who attended the meeting included the following: President W. H. Sawyer, J. P. Barnes, L. S. Storrs, J. W. Welsh, J. V. Sullivan, E. P. Waller, B. A. Hegeman, Jr., Thomas Finigan, G. A. Richardson, T. A. Kenney, M. B. Lambert, S. J. Cotsworth, C. R. Ellicott, H. L. Brown, T. W. Casey, G. L. Kippenberger representing E. B. Meissner, J. S. Kubu representing C. B. Proctor, J. H. Alexander, C. H. Beck, Paul Wilson, Martin Ackerman, E. F. Wickwire, W. R. Power, F. C. J. Dell and Charles Gordon.

CLEVELAND CONVENTION PLANS ALMOST COMPLETE

Chairman H. L. Brown of the subjects and meetings committee reported that the program for the Cleveland convention was almost complete, with acceptances received from both of the speakers. A complete outline of the program is published elsewhere in this issue. Advance tickets for the noonday luncheon meetings on Tuesday, Wednesday and Thursday of convention week are being sold rapidly, and there were indications that space would not be available at some of the luncheons for delegates who failed to obtain their tickets at an early date.

The membership committee's report presented by Chairman C. R. Ellicott showed a current membership of 320 operating companies, 35 associate companies, 440 manufacturing companies, and 1,175 individuals. In the absence of Chairman J. H. Hanna, Managing

Director Storrs for the special subcommittee on depreciation said that a meeting of the full committee, together with the committee on national relations would be held some time during the convention. Mr. Storrs also reported that the hearing on the steam road depreciation case would be held on Nov. 9 by the Interstate Commerce Commission. The committee has been assured that the electric railway case will not be called up until after the steam road decision is made by the commission.

CHANGES PROPOSED IN CONSTITUTION AND BY-LAWS

Changes in the constitution and by-laws have been prepared in pamphlet form to show the old and new provisions, for the information of delegates voting on the new constitution at the convention. Chairman E. F. Wickwire, for the committee on co-operation of manufacturers, reported progress in the preparation of two booklets for distribution at the convention, one on stimulating the replacement of obsolete equipment, and the other on suggestions for increasing the sale of car rides.

A report by the nominating committee, read by Chairman C. R. Ellicott, placed the names in nomination for officers and members of the executive committee for the ensuing year. These were published in the issue of Aug. 6, page 242.

Progress in the study of the statistical work of the association, and in the co-ordination of statistical activities on the part of the several agencies in the electric railway field, was reported by Chairman J. P. Barnes. A meeting of the committee will be held in New York on Sept. 19 for the purpose of drawing up final recommendations.

Managing Director Storrs called attention to the apparent apathy on the part of operating companies toward some of the awards offered to the industry for outstanding accomplishments. He called particular attention to the opportunity offered by the Brady Safety Award for capitalizing the safety of electric railway transportation in the eyes of the public. Entries in the Brady competition have been very disappointing, Mr. Storrs said, and indicate a failure on the part of operating companies to take advantage of the opportunity afforded. Members of the executive committee were urged to co-operate in promoting the advantages of that contest. Plans prepared by the committee on education for its program during the coming convention were read by Secretary Welsh in the absence of Chairman Edward Dana. Enough registrations in the training course for foreman-conference leaders are in hand to show that the course will be well supported. The committee is planning an educational day at the convention for Friday, Oct. 7.

RAPID TRANSIT REPORT REVIEWED AND COMMITTEE CONTINUED

G. A. Richardson, chairman, reviewed the report of the committee on rapid transit, which has continued the collection and interpretation of information on the subject for a period of several years. In the 1927 report the entire question of financing rapid transit, and the allocation of costs, is developed. The work of the committee has consisted in the establishment of fundamental principles regarding rapid transit construction and economics, which are expected to lay the foundation for sound financing of such construction in the future, which in turn will permit more extensive development of rapid transit facilities throughout the country than would otherwise have been the case. Although Mr. Richardson expressed the opinion that the committee's work this year would be so far completed as to avoid the need for its continuance during the next year, it was the opinion of the executive committee that the special committee should be continued in order to tie together, for the purpose of continuity of thought, the representative membership which is included. It was felt that even though only a single meeting be held next year, and no formal report prepared, there would be considerable advantage for the industry in having the committee in essentially its present organization and membership.

The insurance committee, according to chairman Paul E. Wilson, will report a second year of favorable fire loss showing. The committee will also recommend that it be authorized next year to negotiate with rate-making bodies for a general rate reduction in electric railway insurance based upon the experience record of the industry. Mr. Wilson reported an increased interest on the part of all electric railway companies in fire prevention work and said that present figures show a profit

COMING MEETINGS

OF

Electric Railway and Allied Associations

Sept. 7-9—American Society of Mechanical Engineers, Machine Shop Practice Division, first national meeting, Mason Laboratory, Yale University, New Haven, Conn.

Sept. 8-9—Central Electric Railway Master Mechanics Association, Hotel La Salle, South Bend, Ind.

Sept. 13-15—International City Managers Association, Dubuque, Ia.

September 19-23—American Welding Society, national meeting, Book-Cadillac Hotel, Detroit, Mich.

Sept. 26-30—National Safety Council, annual congress, Hotel Stevens, Chicago, Ill.

Oct. 3-7—American Electric Railway Association, annual convention, and exhibit, Public Auditorium, Cleveland, Ohio. Exhibits open at noon of Oct. 1.

for the insurance companies of 18 per cent on electric railway car policies.

After some discussion it was tentatively decided to throw the convention exhibit open to the Cleveland public on Sunday afternoon and Wednesday night of convention week. President J. H. Alexander of the Cleveland Railway, as chairman of the exhibit committee, said that no trouble was anticipated from this admission of the public, and that adequate police protection would be provided to insure that exhibits will not be disturbed. An early attendance on the part of delegates to take advantage of the opening of exhibits on Saturday noon preceding convention week is indicated by the report of Paul E. Wilson, chairman of the hotel committee, that almost half of the hotel reservations so far made indicate arrival of delegates on Saturday. Regarding housing accommodations available, Mr. Wilson also reported that the Cleveland, Hollenden and Statler rooms have all been reserved, but that many good rooms in downtown hotels are still available. Telephone facilities are to be increased 100 per cent over what were available last year in order more effectively to handle convention business. Still further to facilitate inter-communication between hotels, there will be special telephone stations provided in each hotel, so that a delegate making a call from one hotel can use a station directly connected to the switchboard of another hotel. Advance registration indicates a total attendance that will exceed that of last year.

SPECIAL TRAINS PLANNED

On the subject of transportation, Carl Beck, chairman of the committee, reported arrangements for special trains from St. Louis, Chicago, New York and Boston. Most of these trains, with the possible exception of those from Chicago, will arrive Saturday night or Sunday morning, in order to permit delegates to attend the exhibit before the opening of the convention on Monday morning. Every effort will be made to stimulate early arrival by delegates.

A resolution commending the work done by J. W. Colton as editor of *Aera* was read by Secretary Welsh upon suggestion of G. A. Richardson. This resolution, which read as follows, was unanimously adopted by the executive committee.

Whereas, the executive committee of the American Electric Railway Association, believing it to be the best policy to discontinue the publication of *Aera* in its present form and supplant it with a smaller magazine without advertising, feels it proper that this statement be made regarding the services of John W. Colton, who has edited *Aera* since 1921;

Mr. Colton's editorship has been of the highest order and the change in the form of *Aera* is in no way a reflection on his ability.

He assumed the editorship at the request of association officials, resigning the editorial page directorship of the *Hartford Times*, to which position he had been called for a long and honorable period in New England journalism.

During the past four years the circula-

tion, advertising and financial results have been completely changed and *Aera* has gained much new circulation among persons outside the industry, including financial writers, students, city officials and others. Therefore, be it

Resolved, that this executive committee extend to Mr. Colton its sincere appreciation of his efforts and assure him that he has performed the duty to which the association officials assigned him to their entire satisfaction.

H. L. Brown was instructed to draw up a suitable resolution thanking Mr. Albee, president of the Keith-Albee vaudeville theaters, for his co-operation in discouraging the needless disparagement of electric railway service from vaudeville stages. A vote of appreciation to L. J. De LaMarter, vice-president and general manager Grand Rapids Railway, for his work in enlisting Mr. Albee's co-operation, was passed by the committee.

The next meeting of the executive committee was fixed for Cleveland, Ohio, on October 7.

Members Elected

NEW members elected at the meeting of the executive committee of the American Electric Railway Association held on Aug. 26 include twelve manufacturers and 34 individuals. A list of new company members follows:

MANUFACTURER COMPANIES

Cincinnati Car Company, Cincinnati, Ohio.
Commercial Shearing & Stamping Company, Youngstown, Ohio.
Graham-White Sander Corp., Roanoke, Va.
Hynson, Westcott & Dunning, Baltimore.
Murray Conduit Systems, New York, N. Y.
Murray Corporation of America, Detroit, Mich.
National Standard Parts Association, Detroit, Mich.
The Russell Manufacturing Company, Middletown, Conn.
Skinner Automotive Device Company, Inc., Detroit, Mich.
Snap-On Wrench Company, Chicago, Ill.
Titeflex Metal Hose Company, Newark.
The Van Dorn Electric Tool Company, Cleveland, Ohio.

Training Course for Foreman-Conference Leaders

THE staff which is to conduct the training course for foreman-conference leaders in connection with the Cleveland convention met in Washington Aug. 29 to 31 with the staff of the Industrial Education Service, Federal Board for Vocational Education. The program for the training course was worked out in detail, insuring the best possible use of the time of the members of the group. It was agreed to be necessary to hold the registration strictly to 50 and to divide the group into morning and afternoon sections, 25 men in each. On Friday, Oct. 7, "Educational Day," the two groups will meet simultaneously, in different rooms, to permit the men to attend the round-table conference, under the leadership of Dr. A. J. Rowland, which is to be held immediately after the educational luncheon on that day. On Saturday,

also, the two sections will meet simultaneously in the morning so that the course will close promptly at 1 p.m. on that day.

Publications Available At A.E.R.A.

FOLLOWING is a list of publications available at the American Electric Railway Association, New York City. The supply is limited but members can obtain them free of charge upon application.

Electric Railway Practices in 1923, 1924, 1925, and Making Transportation Pay—Electric Railway Practices in 1926. Series of four volumes edited by H. H. Norris, reviewing the presentations made by electric railway companies for the Charles A. Coffin Annual Award. The presentations include new developments of progressive properties that have achieved success and show what electric railways are doing to improve transportation and how they are doing it.

Handbook of Modern Electric Railway Methods and Practices, 1925. A compilation of methods, practices, experiences and policies of electric railways of the United States as obtained from the companies by the committee on management and operation of the American Electric Railway Association.

Proceedings of the American Electric Railway Association, 1924, 1925. Annual volumes of convention reports and discussions of the problems confronting the executives of electric railway companies in the successful operation of urban and interurban transportation systems.

Proceedings of the American Electric Railway Accountants' Association, 1923, 1924, 1925. Annual volumes of convention reports and discussions of accounting methods and classifications used by electric railway companies.

Proceedings of the American Electric Railway Claims Association, 1924, 1925. Annual volumes of convention reports and discussions of the problems of the claims and medical departments of an electric railway company.

Proceedings of the American Electric Railway Engineering Association, 1924, 1925. Annual volumes of convention reports and discussions of the standards, recommendations and miscellaneous practices for apparatus and materials in the operation of the equipment, power, way, structures, purchases and stores departments of an electric railway company.

Proceedings of the American Electric Railway Transportation and Traffic Association, 1923, 1924, 1925. Annual volumes containing reports and discussions of the problems of the commercial, personnel, traffic and safety departments of an electric railway company.

Progress in Cars—Report of Committee on Essential Features of Modern Cars, 1926. Contains a series of typical cars, experiences with modern cars of three interurban and five city electric railway companies, passenger car statistics, age of electric passenger cars and a bibliography of articles on car replacements and the advantages of new cars.

Service at Cost Plans, by Harlow C. Clark, 1920. An identical analysis of statutes, ordinances, agreements and commissions' orders in effect or proposed, together with a discussion of the essentials of local transportation franchises.

News of Other Associations

Standardized Practices of the Milwaukee Way Department*

By E. J. ARCHAMBAULT

*Engineer Way & Structures Milwaukee Electric Railway
& Light Company, Milwaukee, Wis.*

RPAIR of tracks and pavement on congested city streets becomes increasingly difficult each year. The growing congestion of vehicular traffic requires more painstaking care in planning the work and in safeguarding the workmen and the public. It is obvious that in the larger cities more track repair work must be done at night to secure the best results, and to do it at the least cost and at the greatest safety to employees. This applies particularly to the replacement of track special work parts, the minor track and pavement repairs necessary in the downtown section of the city, and especially track welding and rail grinding work. The major portion of the work of the track department, however, must necessarily be performed in the daytime. With the co-operation of the city in closing streets temporarily, obviously it can be done with more safety, with greater speed and with better results.

The track construction and reconstruction program in Milwaukee usually comprises the building of 10 to 12 miles of track in paved streets each year. It may be of interest to describe the form of track construction which has been adopted as standard in Milwaukee.

MILWAUKEE TRACK STANDARDIZED

The track trench is usually excavated for the full width of double track to a depth of 21½ in. below the grade of the street. This sub-grade is rolled thoroughly with a 7-ton roller. Sub-grade drains are placed crosswise of the trench at every city manhole connected with a storm sewer. No. 4 crushed limestone is then spread on the sub-grade to a depth of 6 in. and thoroughly rolled. Upon this the new track is placed. No. 2 crushed limestone is used for tamping the track. With fabricated track sections and Lorain electric butt welds the surfacing of the track is done after the welding work has been completed. In certain cases where rail ends are thermit welded the tracks are tamped in advance of the welding operation. Tie plates and tie rods are used on all city and suburban track.

By special arrangement and with the approval of the city 10-in. reinforced concrete pavement has been adopted as standard. Since 1919 more than 300,000 sq.yd. has been laid in the track zone.

The standard rail section used on the Milwaukee system is the 7½-in. No. 102 T-rail, which has a slight bevel on the outside edge of the rail head, bringing the rail ¼ in. above the adjoining pavement.

TRACK FABRICATED IN YARD

In Milwaukee some departure has been made from the usual practice of laying track. Fabricating sections in 62-ft. lengths with the track building machine designed by our engineers enables the building of the track sections in our lower Cold Spring yard, hauling them to the job and placing 1,200 to 1,500 ft. of track in one night. We have found that this practice saves considerable time and confusion over the former method of delivering ties, rails, tie plates, spikes, etc., separately and building the track on the job.

On practically all of the track construction and reconstruction jobs extensive use is made of temporary track on the side of the street. This track is made up in 33-ft. sections, constructed of No. 60 T-rail bolted to 3-in. planks for ties. Kerwin or high type crossovers are used almost exclusively and very little trouble is experienced with derailments, as we have developed a very satisfactory design for the run-off rails for this sturdier and more substantial type crossover.

Trackwork is always carried on so as to cause the least amount of inconvenience to the public. It is the usual practice for the construction engineer to interview the business people along the street and to advise them fully of our plans. We find that this practice is productive of good will. Merchants appreciate this advance information. We make it a point to convince them, by deed as well as word, that we wish to do the work with the least amount of interference to their business. The city of Milwaukee usually permits us to shut off the street entirely to vehicular traffic, enabling the work to be carried on in the most expeditious manner. Proper detour signs are provided by the way department and placed at such places as are suggested by the city or county.

MECHANICAL EQUIPMENT SPEEDS UP WORK

The use of mechanical equipment for carrying on the activities of the way department is important. The way department has three electric shovels on

caterpillar tractors for excavating work, fourteen electric-driven compressor outfits, which operate pneumatic tie tampers and concrete breakers, and two electrically operated tie-tamping outfits, which are generally used on the inter-urban lines. Our equipment also includes a complete concrete paving outfit, with an up-to-date 1-yd. mixer, two bucket loaders with measuring hoppers for properly proportioning the sand and stone, several truck tractor outfits for the delivery of the aggregate to the mixer, and with a special loader for the placing of the cement on the trucks as they proceed to the mixer. This concrete outfit is also provided with a special finishing machine, which has been in use for three years, and produces a finished job which we believe is unsurpassed by any other street railway paving outfit.

For the handling of construction material in the Cold Spring yard the company has a 45-ton Brownhoist electric locomotive and two modern double drum derrick cars which are used for the handling and delivery of temporary and permanent track sections, rail and special work. Probably no single piece of equipment effects greater economies than do these derrick cars. Use is frequently made of these derricks in conjunction with the pile driver outfit and for the air-operated pile driver in breaking concrete where street pavement is removed for track extensions.

MOTOR CARS HAVE PLOWS

The utility division is equipped with modern Differential motor cars and trailers which provide facilities for side dumping so that the material is deposited free of the track, thus minimizing rehandling. Two of the motor cars are equipped with wing plows, air operated, which constitute some of the company's formidable snow-fighting apparatus, in addition to their use for spreading dirt and ballast on open track construction. During heavy snowstorms several trucks are available and provided with the necessary attachments for the quick installation of plows. This equipment supplements the snow sweepers of the transportation department and is used primarily for cleaning landings and special work layouts.

Cold Spring yard is provided with a sand drier outfit of modern design which was constructed a few years ago. Sand is hauled in from our gravel pit, dumped in a hopper, and by gravity is fed to a conveyor leading to the sand drier, whence it passes over a gravity screen discharging the rejection in a separate bin. A substantial structure houses the sand drier and from 4,000 to 5,000 cu.yd. of sand is run through this drier each year for use on city tracks.

The company operates its own stone quarry, about 15 miles north of Milwaukee on the Milwaukee-Northern Railway, an associated company. It is equipped with modern crushing machinery and buildings and a 50-B Bucyrus shovel and 45-ton electrically driven Brownhoist crane. The output of this quarry runs about 300 to 400

*Abstract of a paper presented before the Transportation Section, Wisconsin Utilities Association, Milwaukee, Wis., Aug. 18-19, 1927.

tons per day, the major portion of which is used by the company for track reconstruction and paving work.

CHROME NICKEL STEEL USED IN SPECIAL WORK

It is the standard practice in Milwaukee to use chrome nickel steel on most of the track special work layouts. Its development and use came during the war, when the price of manganese steel made its use almost prohibitive, and we believe that the substitution of chrome nickel steel in place of manganese has been a boon to the industry. We get excellent results with the use of this kind of special work and have adopted it as standard. Chrome nickel steel has a great advantage in that it lends itself admirably for top welding, maintaining uniformly level flangeways in flange-bearing layouts. It permits also of the welding of the joints in the special work layout. In fact, a track special work layout is not installed in Milwaukee today without thermit welding all of the internal joints of the layout except for the standard switch and mate castings, thus making it entirely homogenous. All track special

work layouts are generally paved with granite block.

During the last few years considerable attention has been given by the company to the construction of rapid transit lines. There was completed and put in operation on June 14 of last year the first of these projects. It involved the building of approximately $4\frac{1}{2}$ miles of double track on private right-of-way leading from the west side of Milwaukee to a connection with the Watertown interurban west of West Allis. The building of this line reduced the running time to Watertown by approximately twenty minutes. On June 20 of this year the second step in rapid transit line construction was completed and put in operation. This consisted of a connection between the Watertown line and the East Troy-Burlington line. Although but 1 mile in length, its strategic position enabled a reduction of 23 minutes in running time between terminals. The building of these rapid transit lines has not only speeded up interurban railway service, but has opened up a vast territory for suburban development to the west and southwest of this city.

Motor Buses and Street Railways in Large Cities*

BY KONRAD SIEBER

Managing Director Nürnberg-Fürther Street Railway

REPLIES received from operators in 45 large cities included 30 with both bus and car operation. In 25 of these cases the buses are operated directly by the railway and in the other five by subsidiaries.

The preponderant use of the bus for routes where the traffic is light is indicated by the fact that the annual car trips varied from 128,000 to 461,000 per kilometer of route (205,000 to 738,000 per mile), whereas the bus range was less than half this (8,100 to 172,000 per kilometer of route, or 13,000 to 275,000 per mile of route). The flexibility and small capital investment of the bus are of great benefit in developing new realty values.

Most of the bus routes are not directly profitable, but this is to be expected in view of their extensive use as feeders.

Data on operating and overhead costs are more liberally supplied than reports on profits, but there is room for greater clarity in accounting. The operating expenses of street railways are given as ranging from 45 to 102 pf. per car-kilometer (16.2 cents to 40.2 cents per car-mile), while that of buses are from 34 to 132 pf. per kilometer (13.6

cents to 52.8 cents per mile). The average operating cost of cars was 65.1 pf. per car-kilometer (26.1 cents per car-mile) and of buses 74.5 pf. per bus-kilometer (29.8 cents per bus-mile).

The chief difference between cities in operating cost is due to wages, which range from 65 to 238 pf. (16.2 cents to 59.5 cents) an hour. Next in line is the character of operation. Thus, the same wages and vehicles yield a range of 55.8 pf. to 118.7 pf. per bus-kilometer (22.3 cents to 53.5 cents per bus-mile) because the annual performance ranges from 50,300 km. (31,186 miles) to 18,900 km. (11,718 miles).

The only certainties are that for like conditions the bus costs materially more than the car in power, lubrication and wheel (tire) wear.

Railways usually pay heavier taxes than the buses, reaching a maximum of 14.5 pf. per car-kilometer (5.76 cents per car-mile), whereas the bus maximum is 8.1 pf. (3.2 cents per bus-mile).

Capital charges on street railways range from 5 to 24 pf. per car-kilometer (1.4 to 9.6 cents per car-mile); on buses from 5 to 30 pf. (1.4 to 12 cents). The overhead for railways goes up rapidly as the traffic becomes thinner.

After weighing the various factors involved, it may be said broadly that the dividing line in favor of the rail for a service offering an equal number of seats is a twenty-minute headway,

but with no allowance for interest charges on track. It may also be said that a bus route is not ready for conversion to rail until it is economical to replace the buses with the same or a shorter headway with cars of larger capacity.

There appears to be no great difference in the accident record of the car and the bus. Comparison is difficult in any event, because the two types are used under such different circumstances. The average of thirteen operators showed 5.06 collisions per 100,000 car-kilometers (per 62,000 car-miles) and 5.28 per 100,000 bus-kilometers (per 62,000 bus-miles). The corresponding personal injury averages are 2.66 for the car and 1.74 for the bus. The higher car figure is probably due to the inclusion of trailers as though they were part of a motor car.

Where the bus is operated as supplementary on a unified flat-fare transportation system, rates tend to be the same as on the cars. A number of zone-fare systems, however, charge 30 to 40 per cent more on the buses. Most systems charge higher fares in any event. There are also cases where suburban bus rates are modified if the passenger continues via car.

Chartered service amounts often to 10 per cent of gross revenue at rates varying from 90 pf. to 2 marks per kilometer (36 cents to 80 cents per mile).

RUNNING SPEEDS

Permissible running speed of buses over different sections of city streets ranges up to 45 km. (27.9 miles) per hour, with an average of 30 km. (18.6 miles). Occasionally a speed like 16 km. (9.92 miles) is specified because trailers are used.

On the other hand, many street railways are still supposed to stick to 25-year-old regulations specifying rates like 8 km. (5 miles) per hour over certain sections. The few tramways which are free to run at any speed in the discretion of the motorman are also those showing the least number of accidents per 100,000 ton-kilometers.

Yet some systems report speeds actually below those permitted by ordinance. The range of car running speeds reported is 18 km. to 50 km. (11.16 to 31.0 miles) per hour, and of buses, 25 to 60 km. (15.5 to 37.2 miles).

The difficulty with the lowest-speed railways is that the rates of acceleration are too low to permit satisfactory schedule speeds. In this connection, the new articulated motor-car train of the Berlin Street Railways is commended because it enjoys a good rate of acceleration, even on slippery rail.

Schedule speed (probably exclusive of layovers—Ed.) of street railways ranges from 12 to 17.24 km. (7.44 to 10.69 miles) per hour, and of buses, from 10.8 to 25 km. (6.7 to 15.5 miles). The higher speeds include suburban routes. There is no substantial difference in speed of car and bus under like traffic conditions.

Speed is of such extraordinary importance in large city transport that a

*Abstract of paper presented at Copenhagen convention of the Internationaler Strassenbahn und Kleinbahnverein (International Street and Interurban Railway Association), June 22-24, 1927.

saving of five minutes per trip for each of the 4,000,000,000 riders a year carried by association members would save 20,000,000,000 minutes, worth 200,000,000 marks (approximately \$40,000,000), if the riders' time was valued at 1 pf. (0.25 cent) a minute. Such an increase in speed would bring about 50,000,000 marks (approximately \$12,500,000) more operating revenue and almost as great a saving in operating expenses.

Besides a higher rate of acceleration, the stop spacing, car type, make-up of train and braking equipment are important factors in raising schedule speed.

As to the most efficient capacity for cars, the experience in America with large cars in competition with jitneys and buses on shorter headways is proof that cars must not be so large as to tempt the operator to lengthen headways. Replies to the questionnaire show that operators in large cities are of this opinion, as their preference is for cars 9 to 11 m. (29.5 ft. to 36 ft.) over all. There is a greater difference of opinion concerning the proper motor bus capacity.

On dry roads the braking of cars and buses seems to be equally efficient, but cars are affected somewhat by slippery rail.

RATES OF PASSENGER INTERCHANGE

Wide variations exist in the speed of passenger interchange. On ordinary cars it takes 1.5 to 2 seconds per passenger, but with extra doors this time has been cut to 0.75 second per passenger. Vienna reports a record of 0.3 second per passenger in filling a car with 100 passengers pleasure-bound. Vienna motor cars have three doors and the trailers have four.

On one of the association properties reduced stop time by means of three-door cars and a spacing of 430 m. (1,410 ft.) between stops would produce a schedule speed of 17.2 km. (10.66 miles) per hour.

Theoretically, a satisfactory passenger interchange rate ought to be secured with one exit or entrance passage for every 3.38 m. (10.9 ft.) of car length. On such a car the effective passenger-carrying area would be 5.3 sq.m. (57 sq.ft.) per passage. On buses with no more than two passages at best the area per passage must not exceed 10.6 sq.m. (114 sq.ft.) if the bus is not to fall too far behind three-door cars in handling heavy traffic.

Only five street railway and two bus operators used separate exits and entrances. Others had abandoned this practice because of unbalanced loading and resulting arguments with passengers who could not see why they should not have the right to use any passage available.

Vienna reported a total of 30,000 car passengers handled per hour one way on a single track which is believed to be a world record. Two or three lines of buses would have been required for the same job. A high bus figure is that of 5,680 passengers

per hour for the Fifth Avenue Coach Company between 31st and 42d Street, as given in the *ELECTRIC RAILWAY JOURNAL*, page 590, Oct. 10, 1925.

The plan sometimes suggested of running buses in the downtown areas and cars in the outer areas with transfer of passengers is not desirable. The opposite method would be more logical.

Eight rail systems and eight bus systems operate one-man equipment, but only for light service. At Vienna auxiliary conductors and slot machines for ticket sales help to broaden the scope of one-man operation. Several undertakings gave up one-man operation because their excessive stop time for passenger interchange delayed other street traffic.

INCREASING PASSENGER COMFORT

The consensus of opinion on means for increasing passenger comfort and traffic may be summarized as follows: Replace obsolete cars with new cars possessing large platforms, low floors, low windows with arm rests, pleasing interior, unimpeded outlook, mirrors, leather cushions with suitable proportion of cross-seats, broad aisles, comfortable handholds for standees, good lighting, good ventilation, improved spring suspension, more easily read destination signs, display of pleasing local scenes within the cars, electric heating (with fresh air instead of exhaust in buses), pneumatic tires, six-cylinder buses, decreased noise, better upkeep and greater cleanliness. A variety of track improvements are also desirable, as well as safety islands and more sheltered waiting places. Increased attention could also be given to time-tables for the public and various types of fares to meet the varying degrees of patronage.

Higher schedule speed would be obtained by such measures as: More powerful motors, three or four exits and entrances per car, up-to-date brakes, electric signals (push-button, door contact, etc.), bow contact for current collection, which avoids wire derailment delays, shorter intervals by decreasing train units, synchronized watches and clocks, stops lengthened to intervals of 400 to 500 m. (1,312 ft. to 1,640 ft.) etc.

The increasing congestion from automobiles which use street space so inefficiently calls for many changes in street railway practice, such as re-routing, relocation of tracks in streets and plazas, safety isles, stop-and-go signals and motorman's signals for securing a quicker getaway from the traffic policeman. It is a question whether the street railway should have to bear so much of the burden of reconstruction cost, but it is unwise to follow a needlessly obstructive policy.

The answers to supplementary questions on bus practice showed that pneumatic tires are used almost everywhere with an average life of 30,000 km. (18,000 miles). Seven undertakings have six-wheelers in service. Sixteen undertakings operate with right-hand control, seven with left-hand and five use either.

Reducing Accidents*

By J. H. HANDLON

Claim Agent Market Street Railway,
San Francisco, Cal.

FROM a brief review of the effort now being put forth it would appear offhand that all that we can do to further safety work is to show greater zeal and to render more effective what is now being done. However, I submit these suggestions hopeful that perhaps some, if not all, will, if adopted, be the means of further reducing accidents.

1. I would suggest a closer study of the accident breeding habits of employees. A closer supervision of each man's work and a study of each man's accident record may reveal a tendency on his part to take unnecessary chances, or follow careless habits, or both.

2. The transportation department should be urged to avail itself of the opportunity the claim department offers it to investigate and determine the causes of accidents regardless of whether a claim is presented, for when causes are determined then remedies can be applied, assuming that the conditions are controlled by the company.

3. A careful inspection of company property and trackage should be continually maintained. Construction work; new buildings; street work; new crossings; temporary or permanent diversion of street traffic; new grade crossings; obstructions near company tracks, etc., all set up hazards of which due cognizance should be taken and safety measures adopted to meet these changed conditions.

4. Consideration should be given to establishing a uniform method of detecting, systematically, defects in eyesight and hearing of platform men and some thought to the advisability of devising tests to see how they respond to certain circumstances and conditions.

5. Claim agents should keep fully informed all operating officials of instances that come to their attention of employees being careless or derelict in the performance of their duties, realizing that their impartial investigations disclose facts that would otherwise not be known.

6. Claim agents should also investigate the cost from an accident standpoint so far as possible of any alterations or changes in the rolling stock or any saving effected by their use.

7. Through company magazines and by means of badges, buttons or some other insignia recognition should be given to the platform men having excellent accident records and a permanent safety campaign should be fostered.

8. Every effort should be made to lessen the turn over of platform men on the theory that the experienced trainman is better qualified to prevent accidents. Splendid work in this direction can be done by interviewing every employee who voluntarily leaves the service.

*Abstract of a paper presented before the eighteenth annual convention of the Pacific Claim Agents' Association, Tacoma, Wash., July 21-23.

News of the Industry

Summary of Piedmont Briefs

Pros and cons cited on application of Southern Electric Railway to Build 128 miles of line

QUESTIONS as to the jurisdiction of the Interstate Commerce Commission to issue or withhold a certificate authorizing the construction of an extension of an electric interurban railway, as well as issues raised by the opposition of existing steam railroads to the proposed extension, are discussed in briefs just filed with the commission. The case involves the application of the Piedmont & Northern Railway for authority to connect its existing lines by completing the gap between Spartanburg, S. C., and Gastonia, N. C., 53 miles, and by building from Charlotte, N. C., via Salisbury, to Winston-Salem, N. C., 75 miles.

The application is opposed by the Southern Railway, the Seaboard Air Line Railway, and the Atlantic Coast Line Railroad, with its affiliated lines, the Louisville & Nashville, the Carolina, Clinchfield & Ohio and the Charleston & Western Carolina, while the Georgia & Florida Railroad is supporting the application.

The applicant electric line, in addition to pointing out what it asserts to be the public need for the proposed extension, takes the position that its road is not operated as a part or parts of a general steam railroad system of transportation, and is therefore, by paragraph 22 of section 1 of the interstate commerce act expressly excluded from the operations of paragraphs 18 and 21 of section 1, under which the commission grants certificates of convenience and necessity.

SAYS COMMISSION IS WITHOUT JURISDICTION

It contends that the commission is without jurisdiction also on the ground that the proposed construction was begun in good faith prior to the effective date of paragraph 18 and was never abandoned. However, it asks, that in the event the commission holds it has jurisdiction, the certificates be issued permitting the proposed lines to be built.

The Georgia & Florida, in its brief supporting the application, points out that it operates a line from Madison, Fla., to Augusta, Ga., and is now engaged in extending its line 56 miles from its northern terminus at Augusta, Ga., to Greenwood, S. C., where it will connect with the Piedmont & Northern, so that it is vitally interested in the proposed through routes that would be opened up by the electric line extensions. This company believes that the exceptionally favored territory in Georgia and North and South Carolina, served by the petitioner and the Georgia & Florida, which already has made such remark-

able strides industrially and agriculturally within the last decade, is destined to expand even more rapidly within the next few years. It says that "the Piedmont & Northern will introduce into this territory much needed and healthy competition and thus improve vastly the convenience of the public."

It is also asserted in the briefs in favor of the application that it is supported by every available representative of public interest in the territory affected, including the Governors of North and South Carolina, the Railroad Commission of the State of South Carolina, the Corporation Commission of the State of North Carolina and by representatives of cities and towns, shippers and citizens generally.

As indicated previously in the *ELECTRIC RAILWAY JOURNAL*, the Southern Railway, in its brief, says the Piedmont & Northern is controlled by the "Duke interests" that control the Southern Power Company, Southern Public Utilities Company and other allied companies, and that these relations have resulted in control by it of a vast amount of traffic.

The Piedmont & Northern contends, in its brief, that the community of interest existing between it and the power interests is neither improper, illegal nor opposed to the public interest; that business diverted from other lines will be inconsequential, and that the proposed lines will develop additional traffic and furnish competition in transportation.

Tacoma Railway Replies

Charges in Engineer Harlan's report refuted by Manager Sullivan. Offers solution. Another answer on way. New franchise suggested with sliding scale of fares and fixed minimum return

THE Tacoma Railway & Power Company, Tacoma, Wash., in a 197-page report has replied to the report prepared by Kenneth G. Harlan, city utilities engineer, several months ago. The propriety of the financial set-up of the company, economy of its operation, justification of certain operating and interest charges, valuation for rate-fixing purposes and various other angles to the Tacoma transportation problem have been presented in the report. Taking issue with the city engineer on practically all his theories of public service corporation finance and operation it supplements the report with 121 pages devoted to alleged errors of fact and figures in the city report. The original report took eight months to prepare and covered 221 pages. It was received by the Tacoma management on April 30 and the answer was filed on Aug. 22. The City Council has taken the reply, signed by R. T. Sullivan, manager of the company, under advisement and the author of the original report says he will have an answer to the railway reply within ten days.

USE OF INGENIOUS METHODS CHARGED

It is charged that the Harlan report figured average fare by dividing the number of revenue passengers into the total revenue, including freight, express, advertising space and power sold, rather than including passenger revenue; that it assumed that all power ever purchased by the local street railway companies would have been purchased at a new and reduced rate which the city of

Tacoma municipal light plant put into effect on Aug. 1, 1926, the previous rate having been nearly double the new rate; that it assumed that extensions and betterments were made at no cost, whereas, as a matter of fact the company claims that all of the net earnings available and millions besides have been spent on improvements and betterments.

Replying to the charge that operating costs of the Tacoma street car system were unnecessarily high, the company shows that the Tacoma Railway & Power Company and the Pacific Traction Company are operating efficiently, the cost per car-mile in 1926 having been only 23.12 cents. In this connection it points out that there are only two cities of more than 100,000 people in the United States operating at a lower cost per mile, according to the American Electric Railway Association's analysis.

Whereas the Harlan report asserted that a valuation of not more than \$2,500,000 could be justified, the reply asserted that if a revaluation were made today of the properties in Tacoma, a figure much higher than that allowed by the state now for rate-making purposes would be given, \$10,000,000.

The reply concluded its analysis of the situation with a suggestion for a solution, consisting of a proposal for a new franchise to supplant the 40 existing and varying franchises. This should provide for a sliding scale of fares, depending on the showing of returns made, and permitting the company to earn, if possible, a certain minimum after taxes. Manager Sullivan, in submitting his suggestions

for a solution, asserted the readiness of the company to meet the city more than half-way and do everything possible to give the city an adequate service for the upbuilding of the city.

Engineer Harlan, after a hurried scanning of the company's refutation of

these and other charges, declared it was an attempt to confuse the issue with a mass of irrelevant and unimportant correction of things he never intended to be accurate to the penny. He declared he was ready to meet the company upon all issues raised.

City Council Revises Chicago Bills

Aldermen decide to appoint sub-committee to draft an entirely new set of bills for presentation to Assembly. Governor to be heard from on special legislation session

DETERMINATION on the part of the City Council of Chicago to work out a traction program satisfactory to both city and companies was renewed after a lull of more than three weeks on Aug. 17, when the Aldermen decided to appoint a subcommittee to draft an entirely new set of bills for presentation to the general assembly, if Governor Small keeps his original promise to call a special session in October. The new bills are to represent the city's viewpoint on the legislation required to settle the city's traction problems, while the five bills defeated by the Legislature last June were regarded as company measures.

Prior to the appointment of this subcommittee a written opinion on the validity of the five former bills and their amendments was given the Aldermen by Corporation Counsel Breen. Briefly, the opinion holds that three of the bills and their amendments are constitutional but that two of them are not. The three that were found legal are the subway bill, the local transit commission bill and the measure which changes the cities and villages acts to conform to the proposed changes in other bills. Amendments added to the indeterminate permit and traction unification bills in the house of representatives make them unconstitutional, the opinion holds.

Although the old bills together with amendments are being used as a working basis by the new subcommittee, many important changes have been made in the new drafts. In the two weeks following its appointment, the subcommittee had completed the revision of the entire set of bills, *i.e.*, the measures dealing with the length of franchise grants, local transit commission, unification of local transportation systems, amending the cities and villages act, and the construction of subways. Among the most important of the changes adopted was the elimination of an amendment to House bill No. 437 which limited franchises to 40 years. The new bill would permit the city to grant either an indeterminate permit or a franchise for 20, 30, 40, 75 or any other period.

Revisions to the local transit commission bill provide that four of the five members of that body shall be appointed by the Mayor and the fifth by the County Board, whereas the original bill specified that two members should be named by the Governor, two by the Mayor and one by the County Board.

With the completion of the work of revising the bills, the sub-committee is now ready to report to the full committee.

Anxiety over the prospects for a permanent settlement of the traction problem this fall caused the City Council to appoint a second subcommittee to confer with Governor Small at Springfield Aug. 23 to learn whether he will stand by his original promise to call a special session of the legislature to consider enabling legislation when the city and companies have agreed on a unified transit program. The city's alarm in this matter was attributed to a statement made by the Governor the previous week in which he intimated that he would have the legislature pass the necessary laws only if an ordinance is first submitted to and approved at a popular referendum, as well as by the city and companies.

The Governor refused to commit himself on the matter, however, until he can reach some agreement with Mayor Thompson, and the Alderman returned to Chicago with less hope than ever for a special session.

New Business Campaign of Illinois Traction

A new business campaign was started on July 15 by the Illinois Traction System. It is built on the idea that the modern railway company can no longer be content with accepting only the business that may come to it through the usual channels of solicitation. Its first effort along the line of interesting employees in selling its services was the organization of the Go-Getters Club. This activity has now been enlarged and intensified with the present organization known as the Employees New Business Club, which is extended to employees of Illinois Power & Light Corporation and associated companies. It started its activities with a special 90 day summer campaign. The co-operation of employees of the several associated companies has been invited and is freely given on the basis that whatever is good for the Illinois Traction System is good for the entire company family.

Employees of Illinois Traction System numbering about 2,000 men and women will endeavor during this 90-day special campaign to make an average of one call per day on a prospective customer

for Illinois Traction System service. Each employee will talk to his friends, his neighbors, his lodge and church associates, his local merchant or manufacturer, with the idea in view of selling the services of the railway. Where it is possible to secure a direct piece of passenger, freight or express business this will be done, but the prospects will be told about these services.

Employees of the Illinois Power & Light Corporation in the territory served by Illinois Traction Systems are co-operating in this campaign to the extent of acquainting themselves with the specific services of the electric railway and soliciting business in the same manner as Illinois Traction System employees, except that they are not asked to make daily reports. Neither do they participate in the competitive feature of the campaign.

Referendum to Be Recommended in New York

In his report to the commission which is partially completed Samuel Untermyer, special counsel of the Transit Commission, will recommend a referendum to determine if the voters favor the maintenance of the 5-cent fare on the city's proposed unified transit system with the deficit from operation, if any, carried and paid by the taxpayers. He will make it clear, however, that no loss is expected. His plan will be based on the recapture of the Brooklyn-Manhattan Transit Corporation subway system. Mr. Untermyer's idea is that the returns from these profitable lines will go a long way toward carrying the high-cost new subways at a 5-cent fare.

Negotiations with representatives of the Interborough Rapid Transit Company for the purchase of its lines, unsuccessful so far, are still pending. The great difficulty in the negotiations with the Interborough has been the necessity for making some arrangement with the stockholders of the Manhattan Railway, which owns the Manhattan and Bronx elevated lines, now operated by the Interborough on a 99-year lease.

Dayton and Springfield Properties Sold

The Peoples Railway, Dayton, and the local railway in Springfield, Ohio, owned by the same interests, are reported sold. The new owners are Wood & Turner, Philadelphia.

The Peoples Railway for years was owned by the American Railways. It was later sold to the American Gas & Electric Company. Wood & Turner were anxious to procure the Electric Light & Power Company in Wilmington, Del., owned by the American Gas & Electric Company, but that company is said to have refused to sell the Wilmington utilities unless the two Ohio companies were included. The property is not to be formally transferred until Sept. 15.

Baltimore Fare Hearing Set

The Maryland Public Service Commission has set Sept. 6 as the date to start a hearing for an increase in fares on the application of the United Railways & Electric Company, Baltimore. The company seeks to raise the fare from 8 cents, or two tokens for 15 cents, to 10 cents. In addition it applied for an immediate emergency increase. This plea will be heard first.

An intervening petition against an increase of fare for the United Railways & Electric Company, Baltimore, has been filed with the Maryland Public Service Commission by The People's Committee Against Increased Fares of the People's Corporation.

This petition declares among other things that there is no unforeseen sharp or unusual rise in the cost of doing business or unforeseen lapse in the volume of business; that loss of 29,000,000 passengers since the fare was increased to 7½ cents, despite normal increase in population, is due to the increase and not to automobile competition as contended by the company; unprofitable long riding has grown and short riding has decreased, fare increases being held responsible. The petition says that as a matter of principle and common fairness, the company's right to a fair return on fair value is not disputed, but "we do protest the suicidal and reactionary policy of attempting to increase returns by further advance in fares."

Date Set for North Shore Rate Hearing

A hearing is to be held in Chicago on Sept. 15 before Examiner Hoy on the intrastate passenger rates of the Chicago, North Shore & Milwaukee Railroad within the states of Illinois and Wisconsin. Formal investigation was ordered recently by the Interstate Commerce Commission. In a petition the railroad alleged that its passenger fares between points in each state were below the level of rates charged for interstate travel and that the railroad commissions of both states had refused to permit an increase in local tariffs.

Higher Fare Sought in Madison

The Madison Railways, Madison, Wis., filed a petition with the Wisconsin Railroad Commission on Aug. 17, asking that the rate in Madison be raised to 10 cents for adults and 5 cents for children under twelve years. It was claimed by the company that such increases were necessary to carry out its program of improvements. W. Dineen, secretary of the commission, stated that the petition would be heard in September.

An increase on Jan. 2, 1925, was allowed to provide funds to carry out a program of additions and improvements agreed upon between the railway and the city of Madison. According to the petition, "during the 30 months

which has elapsed since that order was entered the revenues of petitioner accruing under such schedule of rates and fares have been at all times insufficient to provide petitioner with any funds to carry out said program." The petition also stated that the rates of fare had been and were inadequate to afford a reasonable return on the fair value of its property devoted to the service of the public.

If the plea is allowed, tickets or tokens would sell at fifteen for \$1. At present they are seventeen for \$1. School children's tickets would undergo no change in price.

The petition was signed by F. W. Montgomery, president, and Alice N. Montgomery, secretary of the company.

Changes in Holyoke Delayed One Month

At a hearing before the Massachusetts Public Utilities Commission on Aug. 23 on the petition of the Holyoke Street Railway, Holyoke, Mass., for a readjustment of its fare rates and a revision of its zoning system, a delay of one month, making Oct. 1 the day when it is proposed to make the changes effective, was granted on request of city officials of Holyoke and Chicopee. More time was desired by them to study the schedules. A further hearing by the commission on the subject was set for Sept. 21. L. D. Pellissier, president of the company, said it was expected the readjustment would bring in about \$175,000 additional revenue yearly.

An unusual feature of the first hearing before the utilities board, on Aug. 23, was that all the speakers, mayors, legislators, aldermen and selectmen, paid the Holyoke Street Railway the compliment that it was giving satisfactory service, maintaining adequate equipment and presenting a fine upkeep. There was no complaint against the company, but a feeling that it might not be necessary to give it a 25 per cent increase in fares.

State Sues United Railways for Collections from Riders

The State of Missouri on Aug. 29 filed suit in the United States District Court in St. Louis to take from the United Railways a total of \$83,000 collected from car riders last February under the form of an increase in fare which a special United States Court later held was not warranted. At the time the fare increase was put into effect the company was operating under the protection of an order from Federal Judge Reeves of Kansas City.

During this period the company raised the fare from 7 cents to 8 cents, but gave receipts for the extra penny to passengers on demand. Later when the special court ruled against the company those passengers who presented the receipts were paid back the pennies. While the 8-cent temporary fare was in effect the company collected about \$85,000 in

extra pennies, but later returned \$2,000 to patrons who presented the desired receipts.

The state now contends that the company has no legal right to retain the money and that it is the property of the people who paid it. The state seeks to place it in a fund and if the rightful owners do not assert their claims to turn it over to the state treasurer for state expenditures.

The state suit is in the nature of an intervening petition in the federal receivership case. Charles W. Bates, counsel for Receiver Rolla Wells, has stated that the suit of the state will be vigorously opposed.

Charles W. Bull, associate city counselor, several days ago informed the St. Louis Board of Estimate and Apportionment that neither the city nor the state had a legal right to claim the money. That the return of the extra fare was a private matter between the company and the car rider and that if the car rider did not claim the money the company could retain it.

Portland Employees to Serve as Tourist Guides

Franklin T. Griffith, president of the Portland Electric Power Company, Portland, Ore., has suggested through a letter to Mayor Baker of Portland that the services of a staff of seventeen traffic inspectors of his company be allowed to act as volunteer information guides while on duty during convention periods or heavy tourist seasons. He said these men were carefully instructed in service of this character. The Mayor replied that the offer was appreciated as an excellent suggestion and that it would help to create a spirit of welcome to travelers in the city.

Mercury Arc System in Bridgeport

Energy for street railway operation by the Connecticut Company in the city of Bridgeport was changed over on Aug. 23 from the company's own generating system to a mercury arc rectifier system fed from the lines of the New York, New Haven & Hartford Railroad. Mention of the order placed for the rectifiers was made in the ELECTRIC RAILWAY JOURNAL, issue of Jan. 22, 1927, page 189.

Hearing on Schenectady Fares Scheduled

A hearing will be held before the Public Service Commission in Albany, on Sept. 8, on the petition of the Schenectady Railway for permission to increase its cash fare rate in Schenectady, N.Y., and in each operating zone on its Albany, Troy and Saratoga divisions from 7 to 10 cents and school tickets from 2½ to 3 cents. The company also asks the right to increase commutation ticket rates.

Recent Bus Developments

Albany Official Wants Trolley Given a Chance

Bertrand T. Fay, assistant to the vice-president of the United Traction Company and the Capitol District Transportation Company, Albany, N. Y., in an interview with the Albany representative of the *ELECTRIC RAILWAY JOURNAL* on Aug. 18, declared that in his opinion people generally preferred the bus as a means of transportation in Albany because the bus is constantly moving while the cars of the electric railway are often held for long intervals by congested traffic.

When the United Traction Company embarked on bus transportation three years ago Mr. Fay was placed in active charge of the supervision of the bus operation under the direction of the general manager and vice-president. He has made an exhaustive study of bus conditions of traffic as compared with the street car.

Contrary to the opinion expressed by L. F. Loree, of the Delaware & Hudson Railroad, about a year ago, Mr. Fay does not expect the bus to supplant the street car. He said:

If the automobile traffic on the streets which impedes the street car could be speeded up, the street car would rapidly assert its superiority. While the street car invariably arrives at the end of the route ahead of the bus, the people seem to prefer the bus as a means of transportation because it is almost constantly in motion. They think they are getting there quicker.

My personal opinion is that there is no comparing the comfort of riding in a trolley car with the bus. The trolley car is light, airy and roomy. The bus is often crowded and there is a certain amount of gas that will escape into the car. Yet people seem to prefer all this to the trolley car. My idea is that if the trolley cars were given an even chance to go through the public streets and the carriageway was restricted to moving traffic you would solve the problem of rapid transit.

Buses Expected on Five Auburn Lines

There was a further hearing before Public Service Commissioner Lunn on Aug. 30 on the petitions of the Auburn & Syracuse Electric Railroad for approval of declarations of abandonment of five of its lines in the city of Auburn, N. Y.

It was stated by Mr. Elder, city representative, that the city had arranged with a new company to operate bus lines over the routes traversed by the five trolley lines and that it was expected the bus lines would be in operation by Oct. 15, to operate on a 7-cent fare.

Provided the bus lines are established there will be no objection to the abandonment of the trolley lines. It is expected that applications will soon be

made to the commission for the required authority for operation by the bus lines and early hearing will follow. The case was ordered closed by Commissioner Lunn.

Commission Authorizes Seven Rye Lines

The Public Service Commission on Aug. 23 issued to the County Transportation Company, Inc., a certificate covering the operation of seven lines in Rye, N. Y., to provide bus service where street car lines have been abandoned.

The bus routes are not identical with the lines of the railway and the commission's certificate is subject to the terms of the consent by the village authorities granted on April 6, May 23 and June 15 last. There was no opposition to the company's application at a hearing before Commissioner Van Namee.

The company proposes to use eighteen buses, each carrying 29 passengers, with a zone fare of 10 cents with transfers to other zones in Rye.

The change in service is part of the general reorganization by the New York & Stamford Railway of its transportation system in towns and villages in Westchester County.

Bus Terminal Planned in Heart of New York

Plans to establish in New York City, N. Y., a terminal for interurban bus lines are now being executed following the leasing of Astor Court, the private street running from 33rd to 34th Street at the Waldorf-Astoria Hotel, by the Gray Line Motor Tours, Inc. The spacious area leased from the hotel, which owns the property, together with a large room in the western end of the Waldorf, adjoining the court, will give the Gray Line, which has been operating its sightseeing and tours service from the hotel for some time, rights to the 6,000 square feet of space.

Since the recent regulation of the Police Department has necessitated the establishment of permanent terminals off the streets for interurban bus lines, the Astor Court terminal, to be shared by many other bus companies, will go a long way toward solving the traffic and parking problem, as well as centralizing interurban bus operation for the benefit of the public. The station will be operated under the name of the Gray Line Waldorf-Astoria Bus Terminal. It is estimated that it can take care of buses to the extent of from 500 to 700 a day. J. J. Reddington, manager of the Gray Line Motor Tours, says that the establishment of this terminal will stimulate interurban bus travel. The terminal will be operating early in September.

Alabama Buses Under Commission Jurisdiction

Operation of buses over the state highways of Alabama is now under the jurisdiction of the Alabama Public Service Commission, through a bill which was recently adopted by the Alabama Legislature and favored by a number of companies operating bus lines. Under the new law all bus companies are required to file a petition with the commission for a permit to operate. The commission has the right to allow or refuse the petition.

Before the enactment of this legislative act there was practically no law in Alabama governing the operation of buses on public highways. The last State Legislature before the present one did not enact any bus legislation because there were no bus lines in operation in the state at that time.

Virginia Utility Opposes Bus Grant

The Petersburg-Hopewell & City Point Railway, Petersburg, Va., will oppose the operation of a bus line from Petersburg to Hopewell, according to a statement made by Samuel W. Zimmer, president and general counsel for the company. The Southside Transportation Company recently was granted a franchise to operate a bus service between the two cities, effective within 30 days. The car line serves all plants in Hopewell except Hummell Ross. It is proposed by the bus company to operate buses into the plant area. The franchise calls for three buses to be operated daily with a 60-cent round-trip fare between Petersburg and Hopewell. The car line is operating on a 35-minute schedule at a round trip fare of 25 cents for a labor ticket.

The Councils of Petersburg and Hopewell had opposed the granting of the franchise. It is said that the trolley company will appeal the granting of this franchise to the Supreme Court of Appeals of Virginia, on the grounds that the present railway schedule serves the public adequately by the 35-minute schedule now maintained and also that the company has vested rights in the franchise. During the past few years there has been a decrease on account of business conditions, and now, since there has been a considerable increase of traffic between the cities on account of the new industries, Mr. Zimmer believes the car line is entitled to some returns from the investment.

Toledo Considers Golfers' Trials

A special bus service of three buses a day from the end of the Wildwood feeder line to Heather Downs Country Club for the use of golfers, caddies and residents of the district has been started as an experiment by the Community Traction Company, Toledo, Ohio. Service will be increased if the patronage warrants.

Bus Competition for Oklahoma Interurban Railways

Over the protest of both steam and electric railways the Corporation Commission of Oklahoma has authorized through bus transportation between Oklahoma City and Ardmore, Oklahoma City and Stillwater and Oklahoma City and Tulsa. These routes parallel electric lines between Oklahoma City and Norman, Oklahoma City and Guthrie and Sapulpa and Tulsa. The commission has assumed to modify or neutralize the effects of the new competition by prohibiting the motor carriers from picking up or discharging passengers between points served by electric railways, but the latter lines express apprehension over the loss of business heretofore delivered to them at points of connection with the motor routes.

North Shore Line Renews Chicago-Milwaukee Bus Service

Supplementary motor coach service between downtown Chicago and the business center of Milwaukee was re-established on Aug. 20 by the Chicago, North Shore & Milwaukee Railroad. A similar coach service between these cities was started last year by the North Shore Line but was discontinued after a few months because of insufficient earnings.

The new line is operated as a non-stop service between Evanston, Ill., a suburb of Chicago, and Milwaukee. Only interstate passengers are carried. Coaches leave the Auditorium Hotel in the Chicago "Loop" at 8:20 a.m. and 2:20 p.m. daily for Milwaukee, stopping at the North Shore Line rail terminals at Adams Street and Wabash Avenue, Wilson Avenue, Chicago, and Dempster Street, Evanston. Two trips are also made daily from the Milwaukee terminal of the railroad to Chicago. The coaches make the 90-mile run each way in 3½ hours, connecting at Wilson Avenue and Dempster Street with the company's trains to and from Chicago. The new motor coach rate between Chicago and Milwaukee is \$3.06. Tickets are interchangeable, being honored on either the buses or trains.

Service on the new route is furnished with one 29-passenger A.C.F. Newell type parlor-observation coach and one, 29-passenger Fageol parlor coach.

Bus Terminal at Cincinnati Under Attack

The use of Government Square, Cincinnati, Ohio, for a terminal for all motor coaches entering the downtown district may be discontinued if the suit of Eli G. Frankelstein is successful. He seeks in the Common Pleas Court to enjoin Col. C. O. Sherrill, City Manager, from enforcing the order which permitted the use of the square for a bus terminal.

Government Square, in the center of the main business district, is a block

long and about 100 ft. wide. The center of this square for its full length is devoted to buses of both city and interurban lines. These include vehicles on four city motor coach lines, the Cincinnati Street Railway Company's coach lines and Interurban lines to all parts of Ohio and to cities in Kentucky and Indiana.

Mr. Frankenstein declares that in spite of the fact that the square was dedicated to general street purposes the city has barred all vehicles except buses from one-third of its width and these buses have paid nothing in return for this exclusive privilege. He says the lives and property of the traveling public are menaced because people are permitted to cross the lanes of traffic at any point in this block to the consternation of motorists, who never know when some one will dart in front of them to the buses.

The question of removing the terminal from the square has been up for consideration several times, but city officials have delayed action, recognizing that the square is a very convenient location for this loading.

Iowa Tax Law Again Censored

A second attack on the constitutionality of the Iowa law which taxes buses and freight carriers operating between fixed terminals was heard recently in the Polk County (Iowa) District Court. Advancing the charge that the law passed by the 41st General Assembly is discriminatory in its application, the Iowa Motor Vehicle Association and 25 bus operators of the state began suit before Judge William Bonner to prevent the Board of Railroad Commissioners from collecting the so-called tonnage tax. The fight was led by Mrs. Helen Schultz Brewer, well-known Iowa bus operator.

Much of the time in the presentation of the plaintiffs' side of the case was taken up with showing exhibits and other proof that hundreds of other vehicles ranging from heavy freight and passenger carriers down to taxicabs are using and wearing out the Iowa roads, yet pay no part of the tax because they are not operating on regular schedules but between fixed points.

Casper Schenk, counsel for the bus operators, charged that the law was class legislation and that it penalized regularly organized bus and freight lines while the great majority of commercially operated passenger and freight vehicles went tax free.

After hearing the evidence Judge Bonner took the case under advisement.

The first suit brought to test the legality of the tax resulted in a decision by Judge Lester Thompson of the Polk County District Court, in which he held the statute unconstitutional. Appeal was taken by the state and the Iowa Supreme Court ordered the case back to the district court for retrial on grounds that the lower court erred in allowing the facts to be stipulated instead of brought out by testimony.

Operators Come Out of Legal Excitement Unscathed

Bus operators in Georgia have new regulations to observe as a result of the passage of a new motor vehicles measure by the Legislature at its 1927 session.

If they are operating automobiles, the license charge will be made upon the basis of weight, the charge being 50 cents for each 100 lb. or fraction thereof. If they are operating buses they will find the charges the same as last year on a capacity basis, ranging from \$15 to as high as \$1,125 for heaviest trucks. Tractors, except those used exclusively for agricultural purposes, trailers, semi-trailers, and motorcycle side cars will be charged a license fee for the first time in the state.

The speed limit in Georgia has been increased from 35 to 40 m.p.h. for cars under 10,000 lb. For motor vehicles between 10,000 and 16,000 lb., the speed limits have been set at 8 m.p.h. for metal tires, 20 m.p.h. for solid tires and 25 m.p.h. for pneumatic tires. And for buses and trucks of more than 16,000 lb. weight, the speed limits are 5 m.p.h. for metal tires, 18 miles for solid tires and 20 miles for pneumatics.

Other attempts were made to tax bus companies, but all these failed in the closing days of the Legislature.

Line Between Lawrence and Lowell

The Eastern Massachusetts Street Railway, which has sought to establish a bus line between Lawrence and Lowell, Mass., for some time, has been successful in securing permission and the necessary licenses from Mayor Walter T. Rochefort of Lawrence, Mass. It is planned to start operations as soon as possible. All other municipal licenses have been secured and schedules are now being worked out. The line will operate via Tewksbury and Andover.

Fee Charged Intercity Buses

For the first time in four years intercity buses must pay a license fee in Chippewa Falls, Wis., according to the terms of an ordinance recently adopted that all buses operating in and out of Chippewa Falls must pay an annual license of \$25 a year. The police department has been assigned the duty of enforcing the ordinance.

Rail-Light Company Protests Buses

A protest against the application of the Buckeye Stages, Inc., seeking to operate bus service between Columbus, Ohio, and Westerville, has been filed with the Public Utilities Commission by the Columbus Railway, Power & Light Company. The protestant declares that its system has provided ample service between these two points and that additional service could be provided.

Financial and Corporate

Rail Earnings Continue to Show Profit in Pasadena

Continuous losses in income from the operation of buses in the city of Pasadena, Cal., are shown in the June report of the Pacific Electric Railway, recently filed with the City Directors of Pasadena. The report shows a loss of \$10,559 for the month of June, while the first six months of 1927 shows a loss of \$50,172.

During June, 141,247 bus-miles were traveled by the buses in Pasadena, the average earning was 0.1796 cent and the average expense 0.2403 cent. The number of passengers carried on the bus lines in June was 487,022 compared with 529,529 in June, 1926. The report shows 395,499 passengers paid fares, 76,612 rode on transfers and 14,951 rode free. Passenger earnings amounted to \$25,107.

During the same time, the railway transportation in Pasadena has continued to show a profit according to the report, the net operating income for June being \$6,328. Analysis of the passenger traffic on the rail lines for June showed a revenue of \$26,271. A total of 486,012 passengers was carried, 410,395 paying fares, 56,381 riding on transfers and 19,236 riding free. The car mileage traveled was 104,237.

New Bedford Line Sold

Sale of the New Bedford & Onset Railway, New Bedford, Mass., to a New York group whose identity was not revealed, was announced on Aug. 24 by Elton S. Wilde, president of the Union Street Railway of which the Onset line is a subsidiary. Mr. Wilde asserted that the new owners plan to continue operation.

B. M. T. Fights Bond Decision

Seeking a rehearing on its petition the Brooklyn-Manhattan Transit Corporation, Brooklyn, N. Y., has taken issue with the Transit Commission for exceeding its authority in denying the application to issue \$20,000,000 bonds of the New York Rapid Transit Company to be taken by the Brooklyn Company for \$16,000,000. In denying the application the Transit Commission held that the sale of the bonds to the B. M. T., which is the parent company, was among other things prejudicial to the interests of the city of New York because of the city's partnership with the company in the routes on which the cars are to be used.

The application for a rehearing was considered and referred to counsel at the meeting of the commission on Aug. 31. This action on the part of the company is regarded merely as a formality

precedent to an application to the Appellate Division for a writ. Among other things the company contends that Mr. Untermeyer, as special counsel, the commission and the city, said there would be no objection to the sale of \$3,467,000 of the bonds at 80 for equipment for additional operation. Reference was made to this bond sale in the ELECTRIC RAILWAY JOURNAL previously.

Indiana Utility Would Issue Preferred Stock

The Northern Indiana Public Service Company, Gary, Ind., an Insull utility, has applied to the Public Service Commission for authority to issue \$1,300,000 of preferred stock at 6 per cent. The proceeds, according to the petition, are to be used to reimburse the company's treasury for capital expenditures made up to Aug. 1 of this year, and for money used in the retirement and purchase of certain stock.

Plans Purchase of Pennsylvania Property

The Pittsburgh Railways, Pittsburgh, Pa., subsidiary of the Philadelphia Company, is negotiating for the purchase of the Homestead & Mifflin Street Railway, operating more than 3 miles in Homestead, Pa. Expenditures of \$300,000 for improvements are planned if the purchase is completed.

Indiana Line Sold

The real estate, right-of-way and rolling stock of the Fort Wayne & Decatur Traction Company, Decatur, Ind., has been sold to the Indiana Service Corporation of Fort Wayne. The line, 22 miles long, ceased to operate cars on Aug. 9 by authority from the Public Service Commission. Electric power will be continued to Decatur and intermediate points by means of the high-tension line now in service. The work of tearing up the rails will begin soon. Equipment from two substations, which will be removed, will be placed at points on the Indiana Service Corporation lines.

\$7,000 for Batavia Property

The S. Snyder Corporation of Rochester, N. Y., has closed negotiations for the purchase of the physical property of the Batavia Traction Company, Batavia, N. Y., and will begin to dismantle the road immediately. Although no price was announced, it is believed approximately \$7,000 was paid for the property, which includes six cars and other equipment. The Batavia Traction Company operated 5 miles of line.

Combined Surplus in Porto Rico \$925,572

The net income of the Porto Rico Railways, San Juan, P. R., for 1926, after providing for depreciation, amounted to \$426,026. Income derived from other sources, \$9,938, made the total net income \$435,964. These facts were contained in the twentieth annual report.

Interest on first mortgage and refunding mortgage bonds for the year absorbed \$174,329. Provision has been made for the preferred stock dividend for the year, amounting to \$70,000, and a dividend on the common stock, amounting to \$30,000, paid January 15, 1927. The balance of \$141,635 has been

CONSOLIDATED STATEMENT OF PROFIT AND LOSS OF THE PORTO RICO RAILWAYS, LTD., FOR YEAR ENDED DEC. 31, 1926

Net profit from operation for year after providing for depreciation.....	\$426,026
Add: Net income from other sources.....	9,938
	\$435,964
Less: Interest on bonds—	
First mortgage bonds.....	\$109,845
Refunding mortgage bonds.....	64,483
	174,329
	\$261,635
Less: Income tax accrued.....	20,000
	\$241,635
Deduct: Dividend on preferred stock.....	\$70,000
Dividend on common stock.....	30,000
	100,000
	\$141,635
Add: Balance at credit Dec. 31, 1925.....	\$794,926
Less amount applicable thereto.....	10,989
	783,936
Combined surplus carried forward.....	\$925,572

added to surplus account, which has been carried forward at \$925,572. The amount of first mortgage bonds outstanding was reduced during the year by the sum of \$66,500, in compliance with the terms of the trust deed.

The current assets as of Dec. 31, 1926, including bonds purchased for future requirements of the sinking fund, amount to \$814,284, against \$702,298 in the previous year. Current liabilities stand at \$426,139, compared with \$336,618 a year ago. The net working capital of the company has thus been increased by \$22,466, and now amounts to \$388,144. During the year there was expended on capital account the sum of \$158,044, mostly for additions in power and light divisions.

More New Jersey Stock for the Public

Another campaign for the sale of the company's 6 per cent cumulative preferred stock to consumers will be put into effect in the fall of this year by the Public Service Corporation of New Jersey. The sale will be under the supervision of Charles G. Colyer, vice-president of the Public Service Stock & Bond Company, a subsidiary. The total number of preferred stockholders has increased from 2,763 in 1921 to 55,253 on Dec. 31, 1926.

General Engineering Concern Disposes of Utility Holdings

The World Engineering Corporation, Boston, Mass., engaged in the business of construction and appraisals, has announced through its president, Carl M. Pihl, the disposition of its public utility holdings to the J. G. White Management Corporation, 33 Liberty Street, New York City, N. Y. The holdings include the Derry Electric Company, Derry, N. H.; Yarmouth Light & Power Company, Ltd., Yarmouth, Canada; West Virginia Light, Heat & Power Company, Sistersville, W. Va., and the Sistersville & New Martinsville Traction Company, Sistersville.

Louisville Properties Valued at \$28,393,734

Report of the Beeler Organization on the appraisal of the properties of the Louisville Railway, Louisville, Ky., made public by members of the Board of Public Works, recently, showed the total property values of the company to be \$28,393,734. There was a depreciation of \$3,944,952 on the grand total, leaving a balance of \$24,448,782, which is considered the sound property value which will be used as a basis for fixing the rate of fare to be charged by the company in the future.

In making the report public members of the Board of Works refused to comment on the contents as did James P. Barnes, president of the Louisville Railway. Mr. Barnes and Charles Milner, counsel for the railway, conferred with members of the board regarding the report, but did not have time to study its contents. It will be three or four months before the board will be ready to make a statement, according to David R. Castleman, chairman. The report in four large volumes dealt with every phase of the management and operation of the Louisville Railway. A copy of the report was turned over to George W. Hubley, engineer for the Public Utilities Bureau, with the request that he make a study of the contents in order to advise members of the board regarding various items prepared by representatives of the Beeler organization.

Michigan Line Abandoned

The Marquette County Electric Railway, operated under the management of the Michigan Gas & Electric Company, suspended operations on Aug. 20 for an indefinite period. The Twin City Motor Bus Company, managed by W. J. Billing of Ishpeming, Mich., has arranged its bus schedule to follow as closely as possible the route of the cars, with half-hour service between Negaunee and Ishpeming.

The railway has been operated under numerous managements since July 1, 1892. One of the chief obstacles to the successful operation of the road has been the severe winters. Often only summer

schedules were maintained. With the impoverished cars and the inability to add new ones, the company intends to junk the equipment.

\$300,000 Value for Sedalia Railway

The Missouri Public Service Commission on July 2 fixed the valuation of the property of the City Light & Traction Company, Sedalia, Mo., at \$1,765,000 as of Dec. 31, 1925. The figures for the various departments follow: Electrical department, \$1,045,000, including \$950,000 for physical property and \$95,000 for going value; gas department, \$420,000, including \$400,000 physical property and \$20,000 going concern value, and railway department, \$300,000 for physical property and no going concern value, because the lines are being run at a loss.

The property was valued in connection with an application for an increase in rates for gas service in Sedalia. The commission denied the application, holding that present rates are fair and will be continued.

The order stated that the commission in fixing going value had been controlled by the circumstances surrounding each department. The state body said that slow growth of the city in recent years did not indicate immediate prospects of a substantial increase in business or extension of service except in the electrical department.

Foreclosure Decree for Massachusetts Properties

Hearing has been given by Judge Sanderson in the Massachusetts Supreme Court on the form of a decree for foreclosure by the American Trust Company of a \$2,500,000 mortgage on the Boston & Worcester Street Railway, Framingham, Mass., securing a \$2,460,000 bond issue, and a mortgage of the Framingham, Southborough & Marlborough Street Railway, securing \$60,000 bonds. It is understood bondholders will purchase the two lines.

The framing of a decree satisfactory to Judge Sanderson involves many details not yet worked out, and counsel has informed the court that the sale cannot be made before six weeks after the decree has been entered. The upset price to be named in that decree by Judge Sanderson is agreed upon as \$360,000, and the purchaser will have to provide about \$180,000 in cash to meet expenses and charges. Counsel reports that a deficiency of \$90,000 still exists in the finances of the Boston & Worcester in spite of the good work done by Franklin T. Miller as receiver.

Oklahoma Line Suspends

The Chickasha Street Railway, Chickasha, Okla., recently suspended operations because of its inability to meet expenses.

\$23,083,776 Depreciated Value Found for Nashville Properties

The railway and electrical properties of the Nashville Railway & Light Company Nashville, Tenn., are valued at \$26,046,773 as of July 1, 1926, in the report to the Railroad and Public Utilities Commission by the special investigation committee composed of William J. Hagenah, Chicago, and Prof. Albert S. Richey, Worcester, Mass.

The committee was appointed by the commission at the request of the local utility company. The report covers two years of research and computation work. In it the engineers declare that the properties of the company are in good condition, without delayed maintenance, and giving an excellent service to the public.

The estimate of the local properties covered a detailed study of every department of the company, its buildings, tracks, ties, poles, rolling stock, motors, power plants and itemized valuations of every piece of property. The report made to the commission shows an initial cost of \$16,843,201 for the properties, which the statistician declared would cost about \$1.65 for every dollar expended at the time of the establishment of the company and its properties in Nashville.

The depreciation on the \$26,046,773 total valuation as of July 1, 1926, would amount to approximately \$3,000,000 or in detail a total of \$1,918,919 on the railway properties and \$1,044,148 on the electrical properties. This leaves a net valuation of \$23,083,776 for the company's entire holdings in the city.

The report showed that the local company had expended approximately \$3,418,000 for repairs and improvements within the past ten years.

Hocker Line Sold for \$28,500

The Hocker line, officially known as the Kansas City, Lawrence & Topeka Electric Railroad, Merriam, Kan., was sold for \$28,500 to the Sonken-Galamba Corporation, Kansas City, Kan., at a special master's sale on the steps of the Johnson County courthouse at Olathe, Kan., on Aug. 26. The line has not been operating since July 16 following a receivership of eight years.

Nearly 300 residents of Shawnee, Merriam and other points along the line, which extends from Rosedale to near Zarah, Kan., were given a faint hope the Hocker cars would not be discontinued and the property junked. Herman Sonken, who made the successful bid for the line, said after the sale his concern would give a "reasonable" time for the citizens served by the road to take over the property for operation. If the offer is refused the line will be junked.

Lester Blanton, president of the Merriam Chamber of Commerce, said citizens would hold meetings in Merriam to plan an organization to operate the road. He blamed the service rendered for the failure of the line to operate successfully.

Legal Notes

ALABAMA—*Injury to Passenger Trying to Board Car.*

Where a street car stops at a point with a manifest purpose of discharging and taking on passengers, it extends an invitation to that end, and it is the duty of those in charge of the operation of the car to exercise reasonable care and diligence that no person in the act of accepting such an invitation in the usual way is put in a dangerous position. Hence, a passenger, at a regular stopping point, whose hand was caught in the platform door when it was closed and was dragged some distance and was injured, could collect damages. [Birmingham Electric Co. vs. Cleveland, 113 So., 403.]

CALIFORNIA.—*Disclosure of Names of Witnesses Not Obligatory.*

A section of the civil code requires an injured plaintiff to submit himself to physical examination and the defendant to permit the plaintiff's expert to examine the machinery alleged to have caused the damage. A section of the penal code requires the drivers of vehicles which have caused injury to give to the occupants of the vehicle or person injured the names of the passengers, not exceeding five, in the vehicle causing the injury. It was held that neither of these sections requires the motorman on an interurban car to give to the plaintiff in an action for damages the names of the witnesses obtained by him after the accident. [Barrington vs. Pacific E.R., 256 Pacific, 567.]

CALIFORNIA—*Motorman May Assume that Motorist Will Use Due Care.*

Where an autobus driver approaches a railway crossing coincidentally with a railway car, the continuing duty rests upon him to use reasonable caution in protecting his passengers from collision. He must presume that the motorman of the car, in reasonable probability, would continue up to and over the crossings without slowing up. The motorman may presume that the autobus driver approaching the railway crossing will use due care and need not check the otherwise rightful speed of his car in passing such crossing until he has reason to believe that the bus driver is neglecting to use care. [McCarthy vs. Pacific Elec. Ry., 255 Pac., 868.]

KENTUCKY—*Several Charges to Bus Lines Not Double Taxation.*

The law imposing a franchise tax on companies possessing special privileges from the State was held to cover bus lines. Charges for use of the highway can also be collected from them by the State under its police power, provided these charges are intended for the repair of special injuries to the highways caused by the operation of the buses. Additional charges can also be collected to help to defray the expenses of administering this law. These several

charges do not constitute double taxation which is prohibited under the Kentucky constitution. The fees mentioned for the use of the highway, etc., may properly be measured by capacity and weight, as well as a charge for the tag required for each of them. [Blue Coach Lines vs. Lewis, et. al., 294 S.W., 1080.]

ILLINOIS—*Policy on Issue of Certificates Defined.*

It is the policy of the State, established by legislation for the regulation of public utilities, to provide the public with efficient service at a reasonable rate by compelling established utilities occupying a given field to provide adequate service and at the same time protect them from ruinous competition. Where an additional or extended service is required, and a utility in the field is willing and able to furnish the required service, the Commerce Commission is not justified in granting a certificate of convenience and necessity to a competing utility until the existing utility has had an opportunity to demonstrate its ability to give the required service. While priority in the field is an element to be considered, it will not of itself govern the granting of the certificate. Where the extension of service of an existing utility was required and it proposed to furnish that service only by transferring passengers at a point which was without adequate facilities for the necessities and convenience of passengers while awaiting transfer, the Commission was warranted in granting a certificate to another company which was willing to give through service. [Bartonville Bus Line, vs. Eagle Motor Coach Company, 157 N.E., 175.]

MASSACHUSETTS—*A Utility May Be Responsible for Passenger's Injury.*

A street railway, as a carrier of passengers, may be liable for negligence in failing to warn a passenger of danger in alighting from its car or in failing to see that he alights in safety. [Williamson vs. Boston Elevated Ry., 156 N. E., 21.]

MASSACHUSETTS.—*Responsibility Defined for Construction Defects in City-Owned Subway.*

The Tremont Street subway was constructed by the Boston Transit Commission, which ceased to exist in 1918, all of its powers and duties being imposed on the city of Boston. The subway is now owned by the city, which derives a return from it. The service in the subway is supplied by the Boston Elevated Railway. A passenger was injured by falling into an open space left in the original construction between the station platform and the car body and brought suit against both city and company. The latter was held not responsible, as the platform was designed and constructed by public authority, and the city also was not responsible because

the subway is a public enterprise for the general welfare, hence the city cannot be deprived of the defenses which are open to the public agency in undertakings of this kind. [Bartol, vs. City of Boston and Boston E.R., 156 N. E., 844.]

NEW YORK—*Motorman Held Not Responsible for Pedestrian's Acts.*

A pedestrian who, in crossing a street between blocks, stepped in front of an approaching car 20 to 25 ft. away, and was struck by the near corner of the car, was held guilty of contributory negligence and motorman was not held negligent, as he was not required to anticipate the pedestrian's acts. [Schneller vs. Ninth Ave. Ry., 220 N. Y. Supp., 434.]

MINNESOTA—*Railway Not Liable for Injuries to Repairer of Fire Alarm Wire Attached to Its Poles.*

A fire alarm wire was attached to a railway pole without the company's express consent, though without its objection. When the wire broke a person not an employee of the city but with the consent of the fire department began to make repairs and was injured when the pole broke. The company had not given permission to anyone but its own employees to climb the pole and was held not liable for the injuries. [Howard vs. Minneapolis & St. P. S. R. Co., 214 N.W., 658.]

MISSOURI—*Duty of Pedestrians When Crossing Street to Look and Listen.*

In order not to be guilty of contributory negligence, one must, before entering on a street railway track, look and listen in both directions for cars, provided by looking and listening he could discover their approach. Where the view of a person is obstructed as he approaches a railroad track, he must look in both directions for approaching cars after he passes the obstruction and reaches a point from which looking would be rendered effective. [Zlotnikoff vs. Wells, 295 S.W., 129.]

MISSOURI—*No Damages Allowed for Mental Distress.*

No recovery can be had for fright, terror, anxiety or mental distress caused by negligence, where unaccompanied by any personal injury, or for personal injuries caused solely by mental disturbances without external impact. [Gibbon vs. Wells, 293 S. W., 89.]

WASHINGTON.—*Commission May Anticipate Future in Granting Certificates.*

In granting certificates of convenience and necessity, allowing the operation of motor transportation companies under the State Law, the Department of Public Works may anticipate the future as well as consider the present necessity and convenience. Such action was upheld as regards a district not completely served by a railway, although the latter was not given a special opportunity to furnish increased facilities before the competing carrier was licensed. [Northern Pacific Ry. et al. vs. Department of Public Works, 256 Pacific, 333.]

Personal Items

Walter J. Cummings New President of Chicago and West Towns Railway

Walter J. Cummings, an outstanding figure in the industrial and civic life of Chicago and president of the Cummings Car & Coach Company, was elected president of the Chicago & West Towns Railway, Oak Park, Ill., on Aug. 22, succeeding the late ex-judge Willard M. McEwen. The new incumbent's connection with this railway

1879, at Springfield, Ill. His early training was in the banking business. The Chicago & West Towns Railway, over which he now assumes executive control, operates 67 miles of electric railway in the section lying just west and southwest of the Chicago. In addition, it owns more than 7 miles of track which are leased to the Chicago Railways Company. The company also operates bus lines supplementing its railway service.

G. I. Wright, Engineer of Electric Traction at Reading

G. I. Wright has been appointed to the new position of engineer of electric traction of the Reading Railroad, Reading Pa.

Following his graduation from Leland Stamford University in 1913 as an electrical engineer he was employed by the Southern Pacific Railroad in connection with the electrification of branch lines. He left that post in 1917 to enter the United States Navy, being appointed electrical officer of the U. S. S. *Montana* after a course of instruction at the Naval Academy. In August, 1918, he was promoted to lieutenant and sent to the Portsmouth Navy Yard to supervise the construction of several submarines.

He resigned from active duty in February, 1919, and for three years was construction superintendent of the Duluth Edison Electric Company, at Duluth, Minn. Following this, he was employed by the Illinois Central Railroad as assistant engineer in charge of electrifying their Chicago Terminal. He was with that company for five years, during which time he was promoted to office engineer and handled all features of that work.

C. H. Forsgard in Toledo. Other Changes in Line-Up

Charles H. Forsgard, who has been made general superintendent of the Community Traction Company, Toledo, Ohio, and given direct supervision of the operations of the company, has been in the service of electric power and railway properties ever since his graduation as an electrical engineer from the Texas Agricultural and Mechanical College in 1911.

Mr. Forsgard is a native of Waco, Tex. His first work was with the Houston Light & Power Company, controlled then by the United Gas & Electric group. Later he went into the Texas Panhandle district to manage three small properties for a Boston financial group. In 1917 he went to the Weston Light & Power Company, in Colorado, later taken over by Henry L. Doherty & Company. Here he re-

mained with this property for seven years and then was transferred to Durham, N. C., in an executive capacity with the Doherty utilities there.

In his new capacity at Toledo, mention of which was made in the *ELECTRIC RAILWAY JOURNAL*, issue of Aug. 13, page 290, he will relieve J. Frank Johnson, vice-president and general manager of the company, from many of the details of operation, permitting Mr. Johnson to take a greater part in the promotion of public relations and general policies of the company.

In the change E. V. Emery, who has been transportation superintendent of the company, will go to the New York offices of Henry L. Doherty & Company.



W. J. Cummings



C. H. Forsgard

Sidney L. D. Jackson, attorney who has been with the law firm of Tracy, Chapman & Welles, general counsel for the company, has also been added to the claims staff of the Toledo company to assist Attorney Donald Finkbeiner.

OBITUARY

WILLARD M. MCEWEN, president of the Chicago & West Towns Railway, Oak Park, Ill., died suddenly on Aug. 18 at his summer home at Ephraim, Wis. Mr. McEwen was an ex-judge of the Superior Court of Cook County and a former law partner of United States Senator Charles S. Deneen. Recently, Mr. McEwen was in the limelight when he directed the litigation of the now famous bus case which resulted in the ruling of the Illinois Supreme Court to the effect that the State Commission must give preference to able existing utilities over those desiring to compete.

HARLEY W. BRUNDIGE, for eight years a member of the California State Railroad Commission, died on July 16. It was in 1919 that Governor Stephens named him to the commission. Prior to that time he had been engaged in journalism, the career he chose after leaving college. His first editorial experience was in Missouri, where he attained distinction. He later went to California and filled several important positions in the newspaper field. Mr. Brundige was born in Ohio in 1865.

property dates back to 1913. He has been chairman of the board since 1918.

As manufacturer and operator Mr. Cummings knows the railway business, senses its needs and has confidence in its future. His active interest in the electric railway industry dates back approximately twenty years when the successful foundry and forging business that had been built up by the Cummings brothers was expanded through the purchase of the McGuire Manufacturing Company, well-known manufacturer of trucks and sweepers.

Later with the addition to its line of products of a gas-electric bus for supplementary railway service, the name of the company was changed from the McGuire-Cummings Manufacturing Company to the Cummings Car & Coach Company. In 1904 Mr. Cummings became vice-president of the McGuire-Cummings Manufacturing Company and president in 1918. His ardent belief in the future of the railway business was expressed in an interview published in *ELECTRIC RAILWAY JOURNAL* for March 27, 1926. He has steadfastly held to the view that the essential nature of the service rendered by the electric railway made its position fundamentally sound. He believed that the bus added a new and valuable agency for handling the type of service that did not justify railway construction and contended that bus operation by electric railways need not be a losing venture when approached from the proper viewpoint.

Mr. Cummings was born on June 24,

Manufactures and the Markets

New Electric Rolling Stock in England

Hitherto the London, Midland & Scottish Railway has employed on its London suburban electrified lines cars open internally from end to end with end and center doors. These are in general similar to those used on the London tube railways and are employed in through service between the Baker Street and Waterloo Railways and Watford on the L. M. S. line. This was started before the railway amalgamations, when the Watford route was part of the then London & North Western Railway. On the other hand the Southern Railway has on its London suburban electrified lines (Brighton section) compartment cars similar to those employed on the steam railways. With this idea in mind the London, Midland & Scottish Railway in its latest order for additional cars has chosen the compartment type. The vehicles are arranged in three-coach units as usual, but two or more units can be coupled up when long trains are required during the busy periods. The new order embraces 28 third-class motor cars, 24 composite trail cars and 23 third-class control trail cars. The body length of motor cars is 59 ft. and of the others 57 ft., with a body width in each case of 8 ft. 11 in. The centers of the bodies are 39 ft. apart. The unladen weights of each type are respectively 56 tons, 28 tons and 30 tons, while the seating accommodation is for 84, 100 and 96 passengers respectively.

The bodies are of No. 14 gage channel finish galvanized steel and the floors are of galvanized steel sheets covered with decolite. The seating is after the usual British steam train type. In general, it may be said that the cars conform largely to standard practice.

Economic Problems Before Chamber of Commerce

The part organized business is to play during the forthcoming year in the solution of outstanding economic problems, such as agriculture, flood control, taxation and merchant marine, will be shaped at a meeting of the national councilors, committees and board of directors of the Chamber of Commerce of the United States to be held at West Baden Springs, Ind., Oct. 15 to 18.

It will be the first meeting of the kind to be called by the national organization and the first conference on questions of national economic policy to be held in the environment of the Middle West. The meeting place has been deliberately chosen with a view to affording business interests of that region the widest possible opportunity to present their views on current economic and legislative problems.

The West Baden meeting will, it is expected, bring to a focus opinion of business executives representing organizations in every state. Invitations have been extended to more than 1,000 national councilors, each representing a trade association or commercial organization in the membership of the national chamber, and approximately 200 officers, directors and members of special committees dealing with particular phases of business activity.

Norfolk Receives Five New Buses

Five new 21-passenger buses have been placed in service at Norfolk, Va., by the Virginia Electric & Power Company, Richmond, Va. They have replaced five buses on the Navy Yard routes. The old equipment will receive a general overhauling and renovation. The routing of two trolley lines, the Craddock and the Park View lines, have been changed by the company.

C. V. Marks Hurt in Fall at Ohio Brass Plant

C. V. Marks, treasurer of the Ohio Brass Company, Mansfield, Ohio, on Aug. 5, was severely injured in a fall down an elevator shaft while inspecting the company's new office building. He suffered several broken bones, which will incapacitate him for some time. His friends in the industry will be glad to learn that apparently no internal injuries resulted and that he is doing very well.

Pre-Convention Flashes from Cleveland

THERE was an enthusiastic meeting of the decorations sub-committee of the A.E.R.A. exhibit committee in Cleveland last week. Fred Dell, director of exhibits, looked wise and mysterious but said very little about the plans formulated at the pow-wow, which was held in the office of Col. J. H. Alexander, president of the Cleveland Railways. A JOURNAL man after much inquisitiveness unearthed that they were going to decorate the decorations under the big roof, and also that miniature artist models of the buildings were approved. Sumpins' in the wind, but the wind ain't blowin' this way.

Speedy and early shipment of cars exhibited on the track section at Cleveland will greatly facilitate the work of the sub-committee which recently met in Cleveland and tentatively laid out the arrangement of the cars.

I. R. T. Receives Large Shipment of Electric Snow Melters

The Interborough Rapid Transit Company of New York City is receiving from the Westinghouse Electric & Manufacturing Company more than 1,060 snow melter units for railway track switches. The shipment is the largest ever made to one company and is the third order of this equipment for the I.R.T. The company will have 3,200 units in use when these are installed.

Electric snow melters have been used by many transportation companies during the past two years and have given exceptional service by keeping track switches open and operating during heavy snow and sleet storms. During the terrific blizzard of February, 1926, when more than 12 in. of snow fell in less than a day, the heaters gave excellent service.

These units are so installed that sufficient heat is generated at the important points of each switch to prevent the collection of snow or the formation of ice. Each switch group of heaters is individually connected to the power line by a fuse and single-throw switch and the yard men can turn them on whenever occasion demands. This simple method of keeping the track switches clear forestalls possible tie-ups of service during sudden storms and removes the necessity of recruiting a large force of men upon short notice.

Construction Commenced on Warehouse for Kansas City Lines

The Kansas City Public Service Company started excavations on Aug. 11 for a large warehouse and office building at the southeast corner of 40th and Summit Streets. The building will house the equipment and working force of the construction department.

The ground dimensions of the warehouse will be approximately 75 ft. by 135 ft. and a part of the planned structure will be two stories high. The two-story portion of the building will be about 75x100 ft. in area and it will contain the locker rooms for the employees of the construction department, of which there are about 100. The ground floor will be used for the protection of welding machines and other valuable equipment of the department.

Due to the considered setting back of Summit Street for a traffic way, the building will be built 30 ft. from the present Summit Street.

A tentative agreement between officials of the city and those of the Public Service company has been reached, it is understood, whereby the company would not oppose the widening of Summit Street through its Westport yards, which are extensive.

The proposed trafficway would start at 38th Street and cut through residential property at 39th Street east of the intersection of Summit and 39th Streets, to avoid cutting into large business and apartment structures at the intersection.

Number of units.....	50	Axles.....	4 1/2 in.	Roof material.....	Wood and canvas
Type of unit.....	Two-man, motor, passenger, city, single end, double truck	Car signal system.....	Faraday	Safety car devices.....	Doors interlock brake and line switch
Number of seats.....	44	Compressors.....	Westinghouse	Sash.....	Bram
Builder of car body, Canadian Car & Foundry Co. City and state.....	Montreal, Canada	Conduit.....	Metco	Seats.....	Ottawa Car Manufacturing Company
Date of order.....	June 14, 1927	Control.....	K-35	Seat spacing.....	30 in.
Date of delivery.....	Sept. 30, 1927	Couplers.....	Bar	Seating material.....	Rattan
Weights:		Destination signs.....	Hunter	Slack adjusters.....	Westinghouse
Car body.....	19,350 lb.	Door mechanism.....	National Pneumatic	Steps.....	Folding
Trucks.....	10,000 lb.	Doors.....	End, folding	Step treads.....	Mason
Equipment.....	6,650 lb.	Fare boxes.....	Coleman	Trolley catcher.....	Keystone
Total centers.....	36,000 lb.	Finish.....	Enamel	Trolley base.....	Nuttall U. S. 26
Boles.....	22 ft. 7 in.	Floor covering.....	Wood slat with Kase stripe	Trolley wheels.....	Ideal
Length over all.....	46 ft. 2 in.	Gears and pinions.....	Nuttall B.P. helical	Trucks.....	Canadian Car & Foundry 790-F
Length over body posts.....	3 ft. 4 1/2 in.	Glass.....	21 os.	Ventilators.....	Railway Utility
Truck wheelbase.....	5 ft. 4 in.	Hand brakes.....	Peacock staffless	Wheels.....	Cast iron, diameter 26 in.
Width over all.....	8 ft. 3 in.	Heat-insulating material.....	Hair	Wheelguards.....	H-B
Height, rail to trolley base.....	10 ft. 1 1/2 in.	Heaters.....	Electric	Special devices.....	Heaters thermostatically controlled
Window post spacing.....	30 in.	Headlining.....	1/4-in. Haske-lite		
Body.....	Semi-steel	Interior trim.....	Cherry		
Roof.....	Arch	Journal bearings.....	Plain	Side posts, corner pillars, wainscoting, girder panels and miscellaneous body parts of aluminum alloy.	
Air brakes.....	Westinghouse variable load	Journal boxes.....	Cast iron	Floor framing of steel.....	Interior finish, window sills and posts, etc. of cherry wood.
Armature bearings.....	Plain	Lamp fixtures.....	Keystone compensating	Floor two-ply wood with tar felt between.	
		Motors.....	Four Westinghouse 510-A-2, inside hung		
		Painting scheme.....	Green and cream		

inghouse variable load brakes. Operation of doors will be interlocked with the line switch and air brakes.

Delay in placing the contract, as indicated in the JOURNAL's issue of March 12, was occasioned by a desire on the part of the Montreal Tramways Commission to consider the advisability of designing a triplex car, also because of the commission's views on further orders for one-man operated units, to which it was in no way committed by reason of the cars of this type ordered last year.

Quincy Mayor Pilots New Trolley

During a recent trial run of one of the de luxe model cars purchased by the Eastern Massachusetts Street Railway, Boston, Mass., for operation on its Quincy, Mass., division, Mayor Thomas J. McGrath relieved the veteran motor-man operating the car, at the suggestion of John H. Hayes, local manager of the company. The party on the try-out run included several representatives of the company, the city and the Quincy Ledger.

The cars, seven of which are to be used on the Quincy division, are being built at a cost of \$15,000 apiece. Each will seat 44 persons. They are finished in mahogany and have dome floodlights and Spanish leather cushions.

ROLLING STOCK

SHORE LINE MOTOR COACH COMPANY, Michigan City, Ind., operating buses from Detroit to South Bend, where connection is made with electric trains of the Chicago, South Shore & South Bend Railroad, has received two White six-cylinder buses.

EASTERN MASSACHUSETTS STREET RAILWAY, Boston, Mass., has received four White buses, model 50-B.

LEAVENWORTH TRANSPORTATION COMPANY, Kansas City, Kan., has accepted six Mack city-type buses, 25-passenger capacity, 196-in. wheelbase, with four-cylinder motors.

BOSTON ELEVATED RAILWAY, Boston, Mass., has placed an order with the Taylor Electric Truck Company, Troy, N. Y., for ten type L. R. H. double trucks, 5-ft. 2-in. wheelbase and 26-in. wheels.

GRAND RAPIDS, GRAND HAVEN & MUSKOGON INTERURBAN COMPANY, Grand Rapids, Mich., announces that the American Car & Foundry Company will deliver six 30-passenger parlor car type buses on Aug. 25, as the first units in the company's plan to co-ordinate electric rail and bus service. The dual service will be effective Sept. 1.

COUNTY TRANSPORTATION COMPANY, bus-operating subsidiary of the New York, Westchester & Boston Railway, New York City, has accepted delivery on seven Mack 29-passenger city type buses, 225-in. wheelbase, with four-

"An' the Gobble'-uns-'ll Git You

if you don't watch your step in signing up for the big Parade at

Cleveland, Oct. 3-8

Those little gobble'uns, "Regret" or "No Space Left" will be a-chasin' you for the next twelve months. Or if you keep pulling off a sound business move you may get the railroad end of a porter-house steak.

Exhibit Now and Rejoice at Leisure

FREDDIE DELL CAN TELL YOU HOW

cylinder motors for operation in Westchester County. Twenty-five Macks are now in service.

TRACK AND LINE

HOLYOKE STREET RAILWAY, Holyoke, Mass., has completed the laying of new rails and the relocating of the track from the side to the center of the street for a total distance of 1 mile on Northampton Street. The work was in two sections, between Sergeant and Cherry Streets and between Hitchcock and Lawler Streets.

SAGINAW TRANSIT COMPANY, Saginaw, Mich., reports the reconstruction of tracks on South Michigan Avenue from the Michigan Central near Dearborn Street to Holmes Street as progressing rapidly. Service is being maintained by means of temporary track laid adjoining the curbing. The new work embodies the latest type of construction; that is, the placing of the steel rails on steel ties and completely imbedding them in solid concrete. It also involves the relaying of 3,400 ft. of track at an expense of \$33,000. The new rail weighs

METAL, COAL AND MATERIAL PRICES— F. O. B. REFINERY

Metals—New York		Aug. 30, 1927
Copper, electrolytic, cents per lb.	13.013	
Copper wire, cents per lb.	15.25	
Lead, cents per lb.	6.55	
Zinc, cents per lb.	6.275	
Tin, Straits, cents per lb.	63.50	

Bituminous Coal, f.o.b. Mines	
Smokeless mine run, f.o.b. vessel, Hampton Roads, gross tons	\$4.325
Somerset mine run, Boston, net tons	1.85
Pittsburgh mine run, Pittsburgh, net tons	1.95
Franklin, Ill., screenings, Chicago, net tons	†
Central, Ill., screenings, Chicago, net tons	†
Kansas screenings, Kansas City, net tons	2.675
†Quotations withdrawn because of strike.	

Materials	
Rubber-covered wire, N. Y., No. 14, per 1,000 ft.	\$9.55
Weatherproof wire base, N. Y., cents per lb.	5.20-5.70
Cement, Chicago net prices, without bags	2.05
Linseed oil (5-bbl. lots), N. Y., cents per lb.	11.5
White lead in oil (100-lb. keg), N. Y., cents per lb.	13.75
Turpentine (bbl. lots), N. Y., cents per gal.	63.0

80 lb. to the yard and is 66 ft. long. Directly underneath the rail is an oak block that absorbs the vibration and noise. Thermit welding of the rail joints is one of the features of the rehabilitation program.

TRADE NOTES

HASKELITE MANUFACTURING CORPORATION, Chicago, announces that in the new Twin Coach designed by F. R. Fageol, Plymetyl is used for 75 per cent of the surfaces, while Haskelite is used for the floor.

WILLIAM E. BROWN, manager of the central station department, New York district of the General Electric Company, has been appointed New York district sales manager. Mr. Brown's headquarters will be at 120 Broadway, New York.

J. G. BRILL COMPANY, Philadelphia, has transferred W. M. Horsell to the Philadelphia plant to represent the company's electric railway division in the southeastern territory. Mr. Horsell was formerly sales representative for the G. C. Kuhlman Car Company in the central states serving this plant of the Brill Company since 1920.

MANGANESE STEEL FORGE COMPANY, Philadelphia, announces the opening of a new office at 1335 Old Colony Building, Chicago, Ill., in charge of W. H. Potter, formerly in the Philadelphia office.

A. H. FERRANDOU, formerly manager of motor coach sales for Dodge Brothers, has been appointed director of the motor coach division. Mr. Ferrandou's experience includes many years in the public utility business. He was an executive of the Washington Railway & Electric Company previous to joining Graham Brothers on June 1, 1925.

ADVERTISING LITERATURE

ACME STEEL COMPANY, Chicago, is mailing a folder describing Acme non-slip steel matting, which is used in machine shops and factories.

GOULD STORAGE BATTERY COMPANY, Inc., Depew, N. Y., has mailed out a bulletin describing the new Gould kathode storage battery.

LINCOLN ELECTRIC COMPANY, Cleveland, Ohio, has just issued a booklet on the "Stable Arc" welder, which outlines the theory of the use of arc welding in production manufacturing.

MARKET DATA BOOK COMPANY, Chicago, Ill., tells of the Market Data Book, and how advertising agencies use the book, in a folder recently issued by it.

COPPERWELD STEEL COMPANY, Rankin, Pa., has distributed a folder describing Copperweld ground rods and ground wire attachments.

OHMER FARE REGISTER COMPANY, Dayton, Ohio, has mailed an announcement of the opening of its Philadelphia sales and service branch.



One of the new cars of the Southern Public Utilities Company, Charlotte, N. C., which were built by the company



*In building its own
new steel cars—
Charlotte standardized on
“Peacock” Staffless Brakes*

Reg. U. S. Pat Off.

An important part of the specifications for six steel one-man, two-man cars just built in its own shops by the Southern Utilities Company, Charlotte, N. C., were the “Peacock” Staffless Brakes.



May we tell you of the many advantages which influenced this Company in standardizing on “Peacock” Brakes?

**National
Brake Company, Inc.**

890 Ellicott Square, Buffalo, N. Y.

Canadian Representative

Lyman Tube & Supply Co., Ltd., Montreal, Can.

The new Charlotte cars are roomy and airy. They are arranged for operation by one man or two men



What SUPERTWIST Adds to Goodyear Tires



One of the Goodyear-equipped fleet of the North Coast Transportation Company, Tacoma, Washington

You know what rugged strength and long life have always been built into Goodyear Pneumatic Bus Tires.

Now you may confidently expect even greater service from Goodyears in motorbus service, because Goodyear Pneumatic Bus Tires are now made with SUPERTWIST.

SUPERTWIST is the extra elastic, extra enduring new material specially developed by Goodyear for Goodyear balloon tires, motorbus and heavy duty cord tires.

It far outstretches ordinary cotton cord, and has a maximum flexing power that yields under impact, protecting the tire from rupture, stone bruise and other in-

juries. It thus insures virtually double the carcass life of the tire.

Other exclusive features of the Goodyear Pneumatic Tire construction for motorbus service are (1) the new Goodyear band-building method; (2) the new Goodyear breaker; (3) the new Goodyear bead—patent applied for, and (4) the famous All-Weather Tread.

These advantages you get only in Goodyear Pneumatic Bus Tires—the only motorbus tires made of SUPERTWIST.

They are real advantages, because they result in the utmost durability, tractive power, road safety, riding comfort and long, trouble-free mileage at low cost.

Goodyear Means Good Wear

GOODYEAR

Copyright 1927, by The Goodyear Tire & Rubber Co., Inc.

101 YEARS OF MANUFACTURING EXPERIENCE

Cane Webbing may be ordered through any H-W sales office.



No. 327-M

FOR INTERURBAN NEEDS

THIS Heywood-Wakefield seat is designed for the modern type of interurban service where comfort is now so important. It has been selected for both new cars and for replacement use.

It has deep, double spring cushions shaped to allow more leg freedom. Mechanism rails are set in. The individual backs are properly pitched for comfort.

Our car seating experts will be glad to help you decide on the best seating equipment for your needs. This service is free through any H-W sales office.

If you have not received a copy of our new Bus Seat Catalogue, write for it.



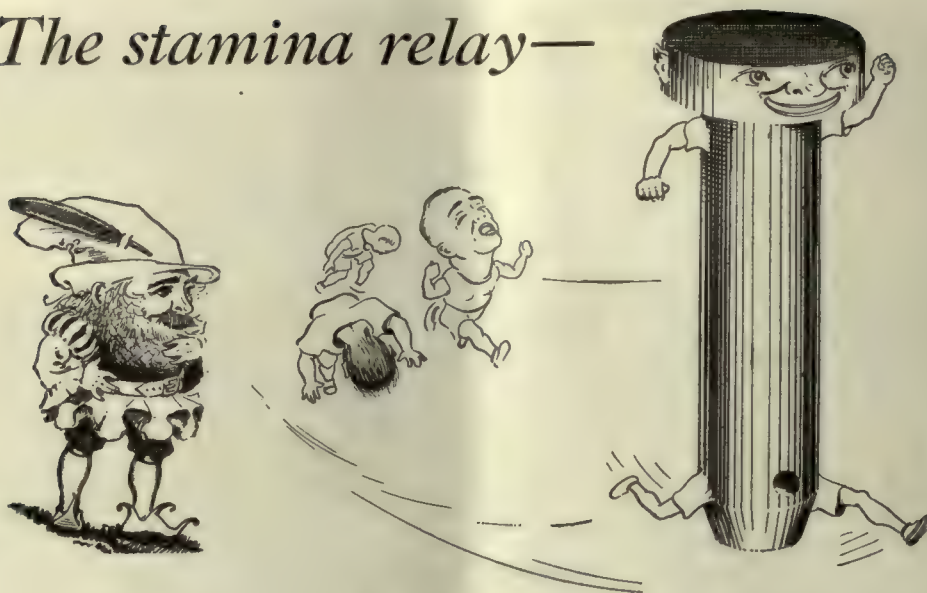
Heywood-Wakefield

REG. U.S. PAT. OFF.

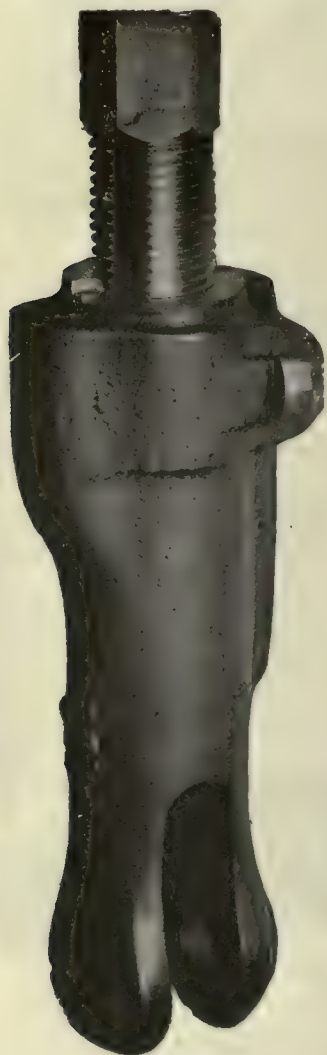
Heywood-Wakefield Co., Wakefield, Mass.; 516 West 34th St., New York, N. Y.;
439 Railway Exchange Bldg., Chicago, Ill. H. G. Cook, Hobart Bldg., San
Francisco, Cal. The G. F. Cotter Supply Co., Houston, Texas. F. N. Grigg,
630 Louisiana Ave., Washington, D. C. The Railway & Power Engineering Corp., 133 Eastern Ave., Toronto; Montreal;
Winnipeg, Canada.



The stamina relay—



“Boyerized” outdistances three standard steel parts!



The McArthur
Turnbuckle

It is an unusual feat for one runner to outrun three runners in relays. Not so with car parts! *Boyerized Car Parts* are outdistancing three to four standard steel parts on the cars of hundreds of electric railways!

Economies such as *BOYERIZED PARTS* effect are reflected not only in actually lower maintenance costs, but in increased car hours, for cars are kept in service instead of in the shops. Brake rigging especially requires every ounce of the extra strength that *Boyerizing* gives.

*Order a few Boyerized Parts for trial—
convince yourself that we're right in our claims.*

Brake Pins
Brake Hangers
Brake Levers
Pedestal Gibs
Brake Fulcrum
Center Bearings
Side Bearings

Spring Post
Bushings
Spring Posts
Bolster and
Transom
Chafing Plates
Bronze Bearings

McArthur
Turnbuckles
Manganese Brake
Heads
Manganese Truck
Parts
Bushings

Bemis Car Truck Company

Electric Railway Supplies
Springfield, Mass.

Representatives:

Economy Electric Devices So., Old Colony Bldg., Chicago, Ill.
F. F. Bodler, 903 Monadnock Bldg., San Francisco, Cal.
W. F. McKenney, 54 First Street, Portland, Ore.
J. H. Denton, 1328 Broadway, New York City, N. Y.
A. W. Arlin, 519 Delta Bldg., Los Angeles, Cal.



Firestone Dealers

SAVE YOU MONEY

and SERVE YOU BETTER

Firestone's scientific study of bus operation—backed by 27 years of tire manufacturing experience—has made possible a bus tire that is cutting mileage costs.

Extra strength and flexibility are assured by the 10 plies of Gum-Dipped cord. The cords of the carcass are dipped in a rubber solution. By this process every fibre of every cord is saturated and insulated with rubber, adding strength and flexibility to the cords, minimizing internal friction and lengthening the life of the tire.

Gum-Dipping is especially important in Heavy Duty Bus Tires because of the friction generated by the flexing of a thick carcass. Extra layers of rubber between the plies make the tire more flexible. They also insure complete insulation against plies being squeezed



together and chafed as a result of the high air pressure required and the heavy loads carried.

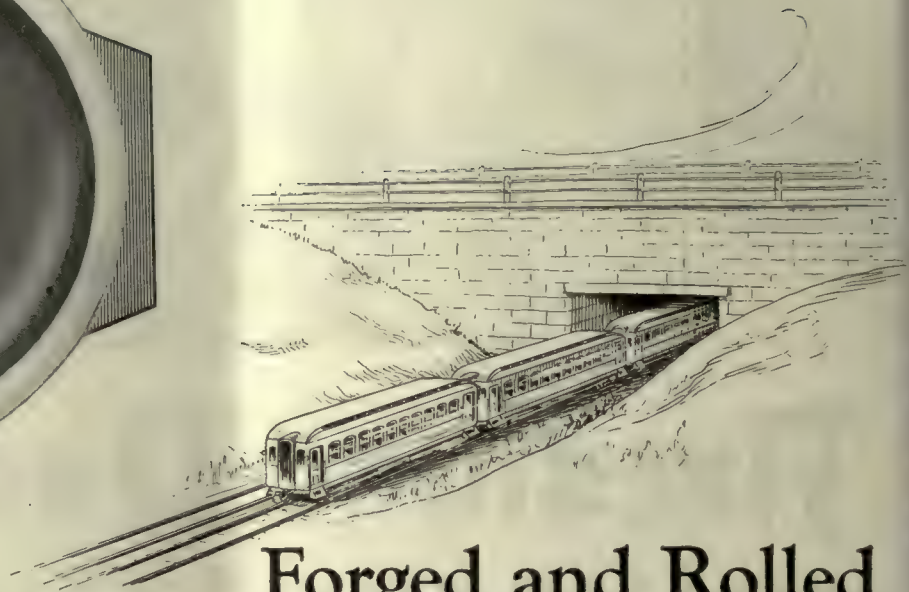
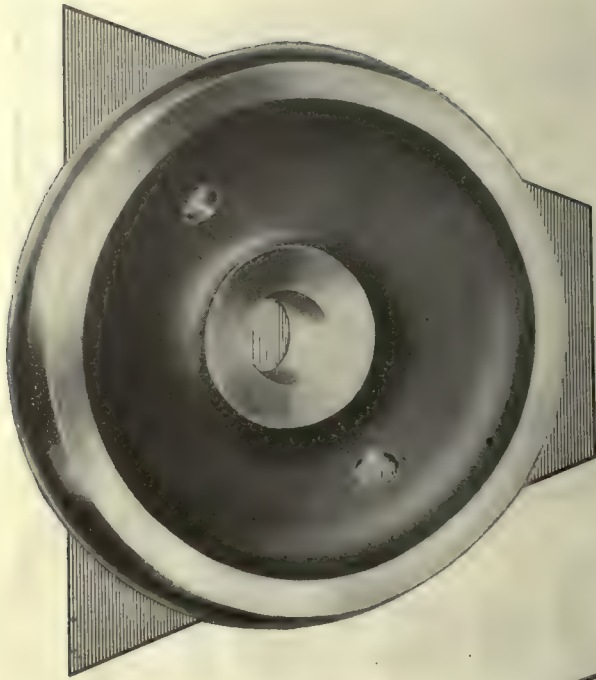
In the scientifically designed Firestone Bus Tire Tread, the continuous rider strip at the center, where most of the weight and wear come, gives smooth rolling and long wear. The safety feature of the design is unexcelled, as it provides a greater number of angles and road gripping edges. The tread, tapering down to form sidewalls, protects against curb and rut wear.

With this quality product, it is natural that Firestone should also take the lead in providing special facilities for rendering convenient and complete local tire service to bus operators. See your Firestone Dealer today. He will save you money and serve you better.

MOST MILES PER DOLLAR

AMERICANS SHOULD PRODUCE THEIR OWN RUBBER . . .

Harvey S. Firestone



Forged and Rolled for safety and maximum mileage

High speed electric railway service imposes an incessant demand upon car wheels for safety and maximum mileage.

Cambria wrought steel wheels are forged and rolled in order to insure safety and maximum mileage.

The forging process imparts strength, toughness and density to the metal—the rolling establishes a grained structure throughout the wheels to prevent breakage and crystallization.

An investment in Cambria Wheels has the additional value of lowering maintenance and repair costs.

*Cambria forged steel Axles,
Cambria light weight Freight
Car Wheels, Standard
Freight Car, Passenger Car
and Locomotive Wheels
are manufactured in the
Cambria Plant of Bethlehem
Steel Company, Johnstown,
Pa.*

BETHLEHEM STEEL COMPANY
General Offices: BETHLEHEM, PA.

DISTRICT OFFICES: New York, Boston, Philadelphia, Baltimore, Washington, Atlanta,
Buffalo, Pittsburgh, Cleveland, Cincinnati, Detroit, Chicago, St. Louis, San Francisco
Los Angeles, Portland, Seattle

*Bethlehem Steel Export Corporation 25 Broadway, New York City,
Sole Exporter of our Commercial Products.*

BETHLEHEM



Check up

Try to form a mental picture of the company
which is selling you lubricants.
Check items on blank below.

Yes	No
☐	☐

1. Is it entirely dependable?

Yes	No
☐	☐

8. Has it a fleet of motor vehicles for local delivery?

☐	☐
--------------------------	--------------------------

2. Has it a wide choice of crude?

☐	☐
--------------------------	--------------------------

9. Has it huge stocks of lubricants of all kinds on hand at all times all over the country?

☐	☐
--------------------------	--------------------------

3. Does it control every process of refining, handling and manufacture?

☐	☐
--------------------------	--------------------------

10. Are the oils of high grade, of constant quality, fully able to meet your varying requirements?

☐	☐
--------------------------	--------------------------

4. Has it adequate and efficient shipping facilities?

☐	☐
--------------------------	--------------------------

11. Can the seller supply all your lubricating needs, and also your burning oils?

☐	☐
--------------------------	--------------------------

5. Does it handle products from well to purchaser?

☐	☐
--------------------------	--------------------------

12. Can the seller supply you with unstinted engineering service through experienced and capable lubricating engineers?

☐	☐
--------------------------	--------------------------

6. Has it thousands of tank cars on all the railroads of the country?

☐	☐
--------------------------	--------------------------

7. Does it maintain warehouses at all important centres?

If your checks show all "Yes's" you are buying from a "good" Company.

If there are a number of "No's" it will pay you to investigate what The Texas Company offers—for the above is a skeleton of some of the things which are earning a very high regard for Texaco lubricants in the Electric Street Railway field.

When do you want to take it up with us?



THE TEXAS COMPANY

Texaco Petroleum Products

DEPT. E 91, 17 BATTERY PLACE, NEW YORK CITY

Offices in principal cities





JOHN N. WILLYS

"Behind the Salesman's Call"

JOHN WILLYS—outstanding American manufacturer and merchandizer—says: "The commodity must be at least two-thirds sold before the salesman closes the purchase."

* * * * *

This publication is a part of that essential selling job that means the ultimate order.

* * * * *

Behind the salesman's call is a great chain of information. Changes in practice, new ideas, new policies of manufacturing and marketing—all these reach your eye as a reader and buyer through the editorial pages.

And just as the editorial pages point out new methods and new opportunities of cost-saving or profit-making so the advertising pages reinforce the editorial content with their specific information on products, commodities or services that will put their new ideas to work in your business.

When you reread this issue think of it not as pages of printed paper but as an inventory of information and products and service to help its readers—its editorial material selected from the best of the present, its advertising pages, the paid announcements and descriptions of the output of businesses made to serve you as yours is run to serve others.



The A. B. P. is a non-profit organization whose members have pledged themselves to a working code of practice in which the interests of the men of American industry, trade and professions are placed first—a code demanding unbiased editorial pages, classified and verified paid subscribers, and honest advertising of dependable products.

This publication is a member of

THE ASSOCIATED BUSINESS PAPERS, INC..



Hale & Kilburn Seats selected for passenger comfort in C., H. & D.'s new cars

As a bid for increased patronage, the Cincinnati, Hamilton & Dayton Railway stressed the importance of passenger comfort in their new cars.

Hale & Kilburn Seats were selected for both city and interurban service!

In their ten new city cars the C., H. & D. installed No. 900-D Double Stationary

Chairs, upholstered in genuine leather and of special deep spring design. Similar chairs of larger proportions were installed in the ten new interurban cars.

This is simply another instance of how Hale & Kilburn Seats meet the requirements of every type of service. Before you make your selection be sure to see the complete line of H & K Seats.

H&K Catalog sent on request

HALE & KILBURN COMPANY

General Offices and Works: 1800 Lehigh Avenue, Philadelphia

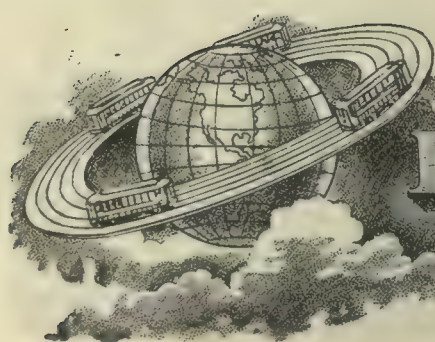
SALES OFFICES:

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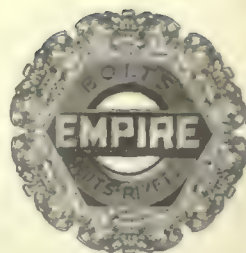
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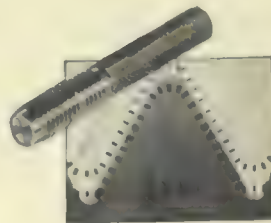
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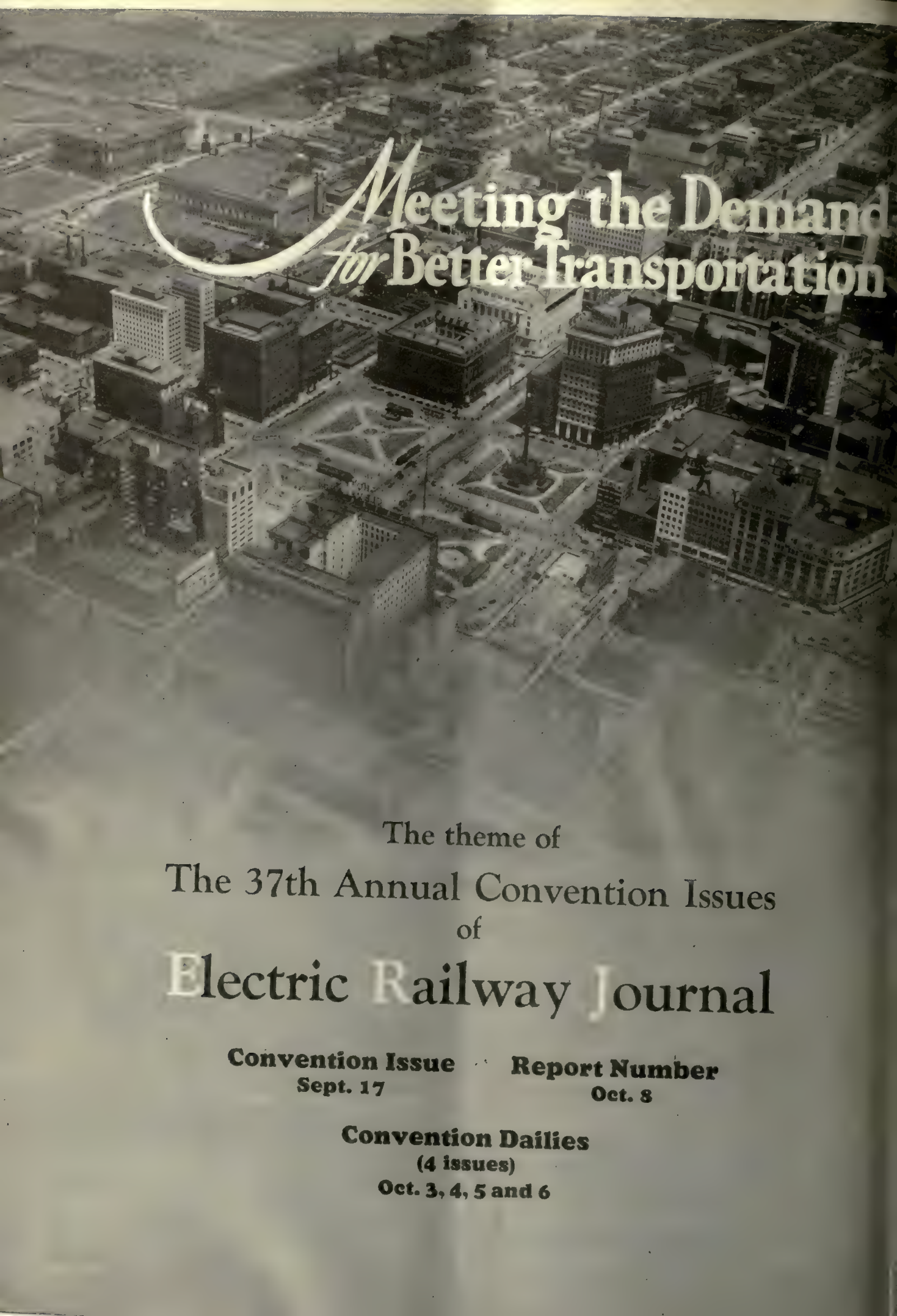
This is the thread profile of an Empire New Process Bolt as projected by the screw thread comparator.



This is the thread of a hardened and ground gauge as projected by the screw thread comparator.

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over 80,000 lbs. tensile strength

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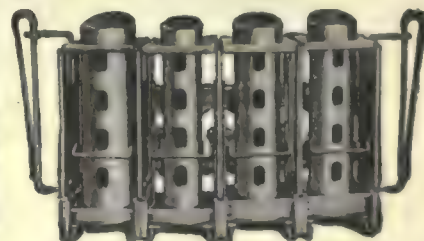
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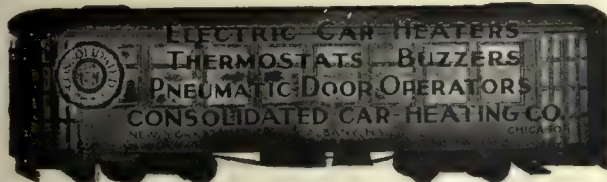
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Elec. Service Supplies Co.
Ohio Brass Co.
Railway Track-work Co.
Una Welding & Bonding Co.

Bonds, Rail
Amer. Steel & Wire Co.
Elec. Service Supplies Co.
General Electric Co.
Ohio Brass Co.
Railway Track-work Co.
Una Welding & Bonding Co.
Westinghouse E. & M. Co.

Book Publishers
McGraw-Hill Book Co., Inc.

Brackets and Cross Arms
(See also Poles, Ties,
Posts, etc.)

Bates Expanded Steel Truss
Co.
Columbia Machine Co.
Elec. Ry. Equipment Co.
Elec. Service Supplies Co.
Hubbard & Co.
Ohio Brass Co.

WHAT AND WHERE TO BUY

Equipment, Apparatus and Supplies Used by the Electric Railway Industry
with Names of Manufacturers and Distributors Advertising in this Issue

Brake Adjusters
Brill Co., The J. G.
Cincinnati Car Co.
National Ry. Appliance Co.
Westinghouse Tr. Br. Co.

Brake Shoes
American Brake Shoe &
Foundry Co.
Bemis Car Truck Co.
Brill Co., The J. G.
St. Louis Car Co.
Taylor Electric Truck Co.
Wheel Truing Brake Shoe
Co.

Brakes, Brake Systems and
Brake Parts
Bemis Car Truck Co.
Brill Co., The J. G.
Cincinnati Car Co.
Columbia Machine Co.
General Electric Co.
National Brake Co.
St. Louis Car Co.
Taylor Electric Truck Co.
Westinghouse Tr. Br. Co.

Brakes, Magnetic Rail
Cincinnati Car Co.

Brushes, Carbon
General Electric Co.
Jeandron, W. J.
Le Carbone Co.
Westinghouse E. & M. Co.

Brushholders
Columbia Machine Works

Bulkheads
Haskellite Mfg. Corp.

Buses
Cummings Car & Coach Co.
Yellow Truck & Coach Co.

Bushings, Case Hardened &
Manganese
Brill Co., The J. G.
Bemis Car Truck Co.
Cincinnati Car Co.
Columbia Machine Works
St. Louis Car Co.

Cables. (See Wires and
Cables)

Cambrie Tapes, Yellow and
Black Varnish
Irvington Varnish & Ins. Co.

Cambrie Yellow and Black
Varnish
Mica Insulator Co.

Carbon Brushes (See
Brushes, Carbon)

Car Lighting Fixtures
Elec. Service Supplies Co.

Car Panel Safety Switches
Consolidated Car Heat. Co.
Westinghouse E. & M. Co.

Car Steps, Safety
Cincinnati Car Co.

Car Wheels, Rolled Steel
Bethlehem Steel Co.

Cars, Dump
Brill Co., The J. G.
Differential Steel Car Co.,
Inc.
St. Louis Car Co.

Cars, Gas-Electric
Brill Co., The J. G.
General Electric Co.
Westinghouse E. & M. Co.

Cars, Gas, Rail
Brill Co., The J. G.
St. Louis Car Co.

Cars, Passenger, Freight,
Express, etc.
Amer. Car Co.
Brill Co., The J. G.
Cincinnati Car Co.
Cummings Car & Coach Co.
Kuhlman Car Co., G. C.
St. Louis Car Co.
Wason Mfg. Co.

Cars, Second Hand
Electric Equipment Co.

Cars, Self-Propelled
Brill Co., The J. G.
General Electric Co.

Castings, Brass Composition
or Copper
Cincinnati Car Co.
Columbia Machine Works

Castings, Gray Iron and
Steel
American Steel Foundries
Bemis Car Truck Co.
Columbia Machine Works
St. Louis Car Co.
Standard Steel Works Co.

Castings, Malleable & Brass
Bemis Car Truck Co.
Columbia Machine Works
St. Louis Car Co.

Catchers and Retrievers,
Trolley
Earl, C. I.
Elec. Service Supplies Co.
Ohio Brass Co.
Wood Co., Chas. N.

Catenary Construction
Archbold-Brady Co.

Ceiling Car
Haskellite Mfg. Corp.
Pantastote Co., Inc.

Ceilings, Plywood, Panels
Haskellite Mfg. Corp.

Chairs, Parlor Car
Heywood Wakefield Co.

Change Carriers
Cleveland Fare Box Co.
Electric Service Supplies Co.

Change Trays
Cincinnati Car Co.

Circuit-Breakers
General Electric Co.
Westinghouse E. & M. Co.

Clamps and Connectors for
Wires and Cables
Columbia Machine Works
Elec. Ry. Equipment Co.
Elec. Service Supplies Co.
General Electric Co.
Hubbard & Co.
Westinghouse E. & M. Co.

Cleaners
Oakite Products

Cleaners and Scrapers, Track
(See also Snow-Plows,
Sweepers and Brooms)
Brill Co., The J. G.
Cincinnati Car Co.
Ohio Brass Co.
St. Louis Car Co.

Clusters and Sockets
General Electric Co.

Coal and Ash Handling (See
Conveying and Hoisting
Machinery)

Coil Banding and Winding
Machines
Columbia Machine Works
Elec. Service Supplies Co.
Westinghouse E. & M. Co.

Coils, Armature and Field
Columbia Machine Works
General Electric Co.
Westinghouse E. & M. Co.

Coils, Choke and Kicking
Elec. Service Supplies Co.
General Electric Co.
Westinghouse E. & M. Co.

Coin Counting Machines
Cleveland Fare Box Co.
International Register Co.
Johnson Fare Box Co.

Coin Changers
Johnson Fare Box Co.
Illinois Motive Equipment
Co.

Coin Sorting Machines
Cleveland Fare Box Co.
Johnson Fare Box Co.

Coin Wrappers
Cleveland Fare Box Co.

Commutator Slotters
Columbia Machine Works
Elec. Service Supplies Co.
General Electric Co.
Westinghouse E. & M. Co.
Wood Co., Chas. N.

Commutator Truing Devices
General Electric Co.

Commutators or Parts
Cameron Electrical Mfg. Co.
General Electric Co.
Westinghouse E. & M. Co.

Compressors, Air
General Electric Co.
Westinghouse Tr. Br. Co.

Condensers
General Electric Co.
Westinghouse E. & M. Co.

Condenser Papers
Irvington Varnish & Ins. Co.

Connectors, Solderless
Westinghouse E. & M. Co.

Connectors, Trailer Car
Columbia Machine Works
Consolidated Car Heat. Co.
Elec. Service Supplies Co.
Ohio Brass Co.

Controllers or Parts
Columbia Machine Works
General Electric Co.
Westinghouse E. & M. Co.

Controller Regulators
Elec. Service Supplies Co.

Controlling Systems
General Electric Co.
Westinghouse E. & M. Co.

Converters, Rotary
General Electric Co.
Westinghouse E. & M. Co.

Copper Wire
American Brass Co.
American Steel & Wire Co.
Anaconda Copper Mining
Co.

Copper Wire Instruments,
Measuring, Testing and
Recording
American Brass Co., The
American Steel & Wire Co.
Anaconda Copper Mining
Co.

Cord, Bell, Trolley, Register,
etc.
American Steel & Wire Co.
Brill Co., The J. G.
Elec. Service Supplies Co.
International Register Co.
Roebbling's Sons Co., John
A.
St. Louis Car Co.
Samson Cordage Works

Cord Connectors and
Couplers
Elec. Service Supplies Co.
Samson Cordage Works
Wood Co., Chas. N.

Couplers, Car
American Steel Foundries
Brill Co., The J. G.
Cincinnati Car Co.
Ohio Brass Co.
St. Louis Car Co.
Westinghouse Tr. Br. Co.

Cowl Ventilators
Nichols-Lintern Co.

Cranes, Hoists and Lifts
Buda Co., The
Electric Service Supplies Co.

Cross Arms (See Brackets)

Crossings
Ramapo Ajax Corp.
Wm. Wharton, Jr. & Co.

Crossing Foundations
International Steel Tie Co.

Crossings, Frog and Switch
Ramapo Ajax Corp.
Wm. Wharton, Jr. & Co.

Crossings, Manganese
Bethlehem Steel Co.
Ramapo Ajax Corp.
Wm. Wharton, Jr. & Co.

Crossing Signals. (See Signal
Systems, Highway Cross-
ing)

Crossings, Track (See Track,
Special Work)

Crossings, Trolley
Ohio Brass Co.
Westinghouse E. & M. Co.

Curtains and Curtain Fixtures
Brill Co., The J. G.
Pantastote Co., Inc.
St. Louis Car Co.

Dealer's Machinery & Second
Hand Equipment
Elec. Equipment Co.
National Power & Machin-
ery Co.
Hyman Michaels Co.

Derailing Switches
Ramapo Ajax Corp.

Destination Signs
Columbia Machine Works
Elec. Service Supplies Co.

Defective Service
Wish Service, Edward P.

Door Operating Devices
Brill Co., The J. G.
Cincinnati Car Co.
Consolidated Car Heat. Co.
National Pneumatic Co.

Doors and Door Fixtures
Brill Co., The J. G.
Cincinnati Car Co.
General Electric Co.
St. Louis Car Co.
Hale-Kilburn Co.

Doors, Folding Vestibule
National Pneumatic Co.

Drills, Track
Amer. Steel & Wire Co.
Elec. Service Supplies Co.
Ohio Brass Co.

Dryers, Sand
Elec. Service Supplies Co.
Ohio Brass Co.
Westinghouse E. & M. Co.

Ears
Columbia Machine Works
Elec. Service Supplies Co.
Ohio Brass Co.
Westinghouse E. & M. Co.

Electric Grinders
Railway Track-work Co.

Electric Rivet Heaters
American Car & Foundry
Co.

Electrical Wires and Cables
Amer. Electrical Works
Amer. Steel & Wire Co.
John A. Roebbling's Sons Co.

Electrodes, Carbon
Railway Track-work Co.
Una Welding & Bonding Co.

Electrodes, Steel
Railway Track-work Co.
Una Welding & Bonding Co.

Engineers, Consulting, Con-
tracting and Operating
Archbold-Brady Co.
Beeler, John A.
Buchanan & Layng Corp.
H. M. Byllesby & Co.
Day & Zimmermann, Inc.
A. L. Drum & Co.
Fails & Co., E. H.
Ford, Bacon & Davis
Hemphill & Wells
Holst, Engelhardt W.
Jackson, Walter
Kelker & DeLeuw
Linn & Marshall Co.
McClellan & Junkersfeld
Richey, Albert S.
Sanderson & Porter
Stevens & Wood
Stone & Webster
White Eng. Co., J. G., The

Engines, Gas, Oil or Steam
Westinghouse E. & M. Co.

Exterior Side Panels
Haskellite Mfg. Corp.

Fare Boxes
Cleveland Fare Box Co.
Illinois Motive Equipment
Co.

Fare Registers
Elec. Service Supplies Co.
Johnson Fare Box Co.

Fences, Woven Wire and
Fence Posts
Amer. Steel & Wire Co.

Fenders and Wheel Guards
Brill Co., The J. G.
Cincinnati Car Co.
Consolidated Car Fender Co.
St. Louis Car Co.
Star Brass Works
Wood Co., Chas. N.

Fibre and Fibre Tubing
Westinghouse E. & M. Co.

Field Coils (See Coils)

Floodlights
Elec. Service Supplies Co.

Floor, Sub
Haskellite Mfg. Corp.

Floors
Haskellite Mfg. Corp.

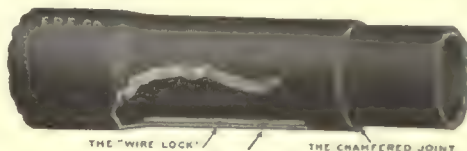
Forgings
Brill Co., The J. G.
Cincinnati Car Co.
Standard Steel Works Co.

Frogs & Crossings, Tee Rail
Bethlehem Steel Co.
Ramapo Ajax Corp.
Wm. Wharton, Jr. & Co.

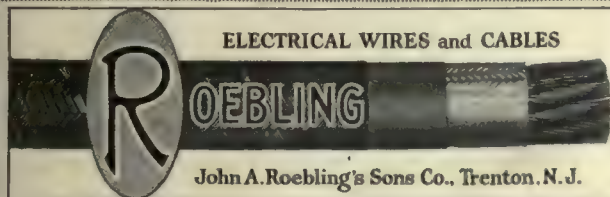
Frogs, Track (See Track
Work)

Frogs, Trolley
Elec. Service Supplies Co.
Ohio Brass Co.
Westinghouse E. & M. Co.

Continued on page 44)

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Lorain Steel Co.
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- Greases (See Lubricants)**
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Railway Track-work Co.
- Grinders, Portable**
Railway Track-work Co.
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Railway Track-work Co.
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Smith Heater Co., Peter
- Heaters, Car, Stove**
Smith Heater Co., Peter
- Heaters, Electric Rivet**
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Ohio Brass Co.
- Hose, Pneumatic**
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Mica Insulator Co.
Okonite Co.
Okonite-Callender Cable Co. Inc.
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Irvington Varnish and Insulating Co.
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General Electric Co.
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Mica Insulator Co.
Okonite Co.
Okonite-Callender Cable Co. Inc.
Westinghouse E. & M. Co.
- Insulation Slot**
Irvington Varnish & Ins. Co.
- Insulator Pins**
Elec. Service Supplies Co.
Hubbard & Co.
Ohio Brass Co.
- Insulators (See also Line Materials)**
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Elec. Service Supplies Co.
General Electric Co.
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Ohio Brass Co.
Westinghouse E. & M. Co.
- Interior Side Linings**
Haskelite Mfg. Corp.
- Interurban Cars**
(See Cars, Passenger, Freight, Express, etc.)
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- Jacks (See also Hoists and Lifts)**
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Columbia Machine Works
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St. Louis Car Co.
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Westinghouse E. & M. Co.
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Nichols-Lintern Co.
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- Lighting Fixtures, Interior**
Electric Service Supplies Co.
- Lightning Protection**
Elec. Service Supplies Co.
General Electric Co.
Westinghouse E. & M. Co.
- Line Material (See also Brackets, Insulators, Wires, etc.)**
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Elec. Service Supplies Co.
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Hubbard & Co.
Ohio Brass Co.
Westinghouse E. & M. Co.
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Cummings Car & Coach Co.
General Electric Co.
St. Louis Car Co.
Westinghouse E. & M. Co.
- Lubricating Engineers**
Universal Lubricating Co.
- Lubricants, Oil and Grease**
Texas Company
Universal Lubricating Co.
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Bemis Car Truck Co.
- Manganese Steel Guard Rails**
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Wm. Wharton, Jr. & Co.
- Manganese Steel, Special Track Work**
Bethlehem Steel Co.
Wm. Wharton, Jr. & Co.
- Manganese Steel Switches, Frogs & Crossings**
Bethlehem Steel Co.
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Wm. Wharton, Jr. & Co.
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Mica Insulator Co.
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- Motor Buses (See Buses)**
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St. Louis Car Co.
Wood Co., Chas. N.
- Motors, Electric**
General Electric Co.
Westinghouse E. & M. Co.
- Nuts and Bolts**
Bemis Car Truck Co.
Cincinnati Car Co.
Hubbard & Co.
- Oils (See Lubricants)**
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- Packing**
Westinghouse Tr. Brake Co.
- Paints and Varnishes (Insulating)**
Dixon Crucible Co., Joseph
Electric Service Supplies Co.
Irvington Varnish & Ins. Co.
- Paints and Varnishes, Railway**
Dixon Crucible Co.
Nat'l Ry. Appliances Co.
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Godwin Co., W. S.
- Pickups, Trolley Wire**
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Ohio Brass Co.
- Pinion Pullers**
Elec. Service Supplies Co.
General Electric Co.
Wood Co., Chas. N.
- Pinions (See Gears)**
- Pins, Case Hardened, Wood and Iron**
Bemis Car Truck Co.
Ohio Brass Co.
Washington Tr. Brake Co.
- Pipe**
National Tube Co.
- Pipe Fittings**
Standard Steel Works Co.
Westinghouse Tr. Brake Co.
- Planers (See Machine Tools)**
- Plates for Tee Rail Switches**
Ramapo Ajax Corp.
- Pliers, Rubber Insulated**
Elec. Service Sup. Co.
- Plywood, Roofs, Headlinings, Floors, Interior Panels, Bulkheads, Truss Planks**
Haskelite Mfg. Corp.
- Pole Line Hardware**
Bethlehem Steel Co.
Elec. Service Supplies Co.
Ohio Brass Co.
- Pole Reinforcing**
Hubbard & Co.
- Poles, Metal Street**
Bates Expanded Street Truss Co.
Elec. Ry. Equipment Co.
Hubbard & Co.
- Poles, Ties, Posts, Piling & Lumber**
Naugle Pole & Tie Co.
- Poles, Trolley**
Elec. Service Supplies Co.
National Tube Co.
- Poles, Tubular Steel**
Elec. Ry. Equipment Co.
Elec. Service Supplies Co.
National Tube Co.
- Portable Grinders**
Buda Co., The
- Potholes**
Okonite-Callender Cable Co.
Okonite Co.
- Power Saving Devices**
National Ry. Appliance Co.
- Pressings, Special Steel**
Cincinnati Car Co.
- Pressure Regulators**
General Electric Co.
Westinghouse E. & M. Co.
Westinghouse Tr. Brake Co.
- Punches, Ticket**
International Register Co.
Wood Co., Chas. N.
- Rail Braces & Fastenings**
Ramapo Ajax Corp.
- Rail Grinders (See Grinders)**
- Rail Joints**
Carnegie Steel Co.
Illinois Steel Co.
- Rail Joints, Welded**
Lorain Steel Co.
- Rail Welding**
Railway Track-work Co.
Una Welding & Bonding Co.
- Rails, Steel**
Carnegie Steel Co.
Electric Equipment Co.
Illinois Steel Co.
- Railway Safety Switches**
Consolidated Car Heat. Co.
Westinghouse E. & M. Co.
- Railway Welding (See Welding Processes)**
- Rattan**
Brill Co., The J. G.
Cummings Car & Coach Co.
Elec. Service Supplies Co.
Hale-Kilburn Co.
St. Louis Car Co.
- Registers and Fittings**
Brill Co., The J. G.
Cincinnati Car Co.
Elec. Service Supplies Co.
International Register Co.
St. Louis Car Co.
- Reinforcement, Concrete**
Amer. Steel & Wire Co.
Bethlehem Steel Co.
Carnegie Steel Co.
- Repair Shop Appliances (See also Coil Banding and Winding Machines)**
Elec. Service Supplies Co.
- Repair Work (See also Coils)**
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Westinghouse E. & M. Co.
- Replacers, Car**
Cincinnati Car Co.
Elec. Service Supplies Co.
- Resistance, Wire and Tube**
General Electric Co.
Westinghouse E. & M. Co.
- Resistances**
Consolidated Car Heat. Co.
- Retrievers, Trolley (See Catchers and Retrievers, Trolley)**
- Rheostats**
General Electric Co.
Westinghouse E. & M. Co.
- Rivet Heaters, Electric**
American Car & Foundry Co.
- Roofing, Car**
Haskelite Mfg. Corp.
Pantasote Co., Inc.
- Roofs, Car and Bus**
Haskelite Mfg. Corp.
- Sanders, Track**
Brill Co., The J. G.
Elec. Service Supplies Co.
Nichols-Lintern Co.
Ohio Brass Co.
St. Louis Car Co.
- Sash Fixtures, Car**
Brill Co., The J. G.
Cincinnati Car Co.
St. Louis Car Co.
- Sash Metal Car Window**
Hale-Kilburn Co.
- Scrapers, Track (See Cleaners and Scrapers, Track)**
- Screw Drivers, Rubber Insulated**
Elec. Service Supplies Co.
- Seating Materials**
Brill Co., The J. G.
Haskelite Mfg. Corp.
Heywood Wakefield Co.
Pantasote Co., Inc., The
St. Louis Car Co.
- Seats, Bus**
Brill Co., The J. G.
Hale-Kilburn Co.
Heywood Wakefield Co.
St. Louis Car Co.
- Seats, Car (See also Rattan)**
Brill Co., The J. G.
Cincinnati Car Co.
Hale-Kilburn Co.
Heywood Wakefield Co.
St. Louis Car Co.
- Second Hand Equipment**
Electric Equipment Co.
National Power & Machinery Co.
Hyman Michaels Co.
- Shades, Vestibule**
Brill Co., The J. G.
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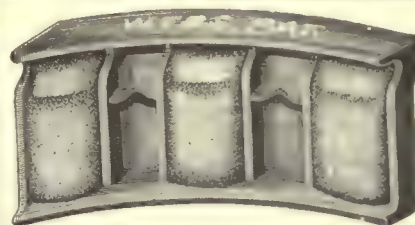
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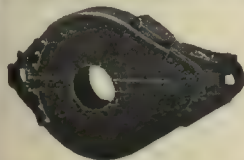
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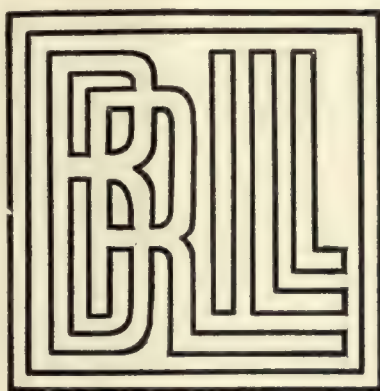
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Yours very truly,
M.M. O'SHAUGHNESSY,
City Engineer

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J. R. Fitzpatrick Vice-President

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By *H. A. Eckhart*
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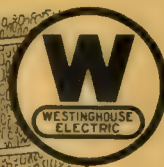
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Vol. 70
No. 11

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Look for the Winners

NEXT WEEK announcement will be made of the awards in ELECTRIC RAILWAY JOURNAL's Maintenance Competition. The material received was of such a valuable character that it was no easy matter for the judges to pick the winners who will receive the capital prizes. In view of the wealth of material submitted it was decided to add a fourth prize, making the awards as follows: First prize, \$200; second prize, \$100; third prize, \$50, and honorable mention, \$25.

Even though the capital prizes have been awarded, maintenance men should bear in mind that the competition for the monthly prizes of \$25 each still continues, and contributions will be received up to April 30 of next year.

Watch for the winners in the Annual Convention Number next week.

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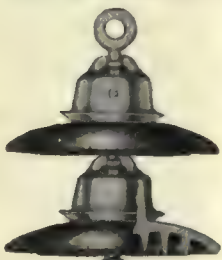


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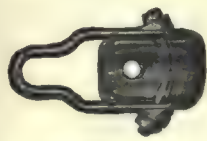


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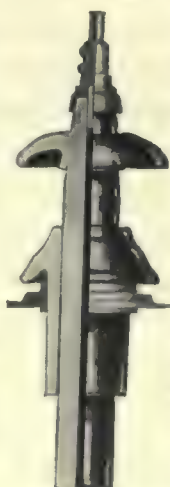
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PORCELAIN INSULATORS
LINE MATERIALS
RAIL BONDS
CAR EQUIPMENT
MINING MATERIALS
VALVES



Making each passenger his own brakeman!

Each passenger boarding a car adds more weight to be controlled by the brakes.

If the ordinary air brake equipment is used, this additional weight will result in a longer stopping distance than when the car was empty—particularly if the car is of the modern light weight type. The longer stop reduces the schedule speed and slows up transportation service for the passenger.

If Westinghouse Variable Load Brakes are used, however, the weight added by each passenger entering the car does not

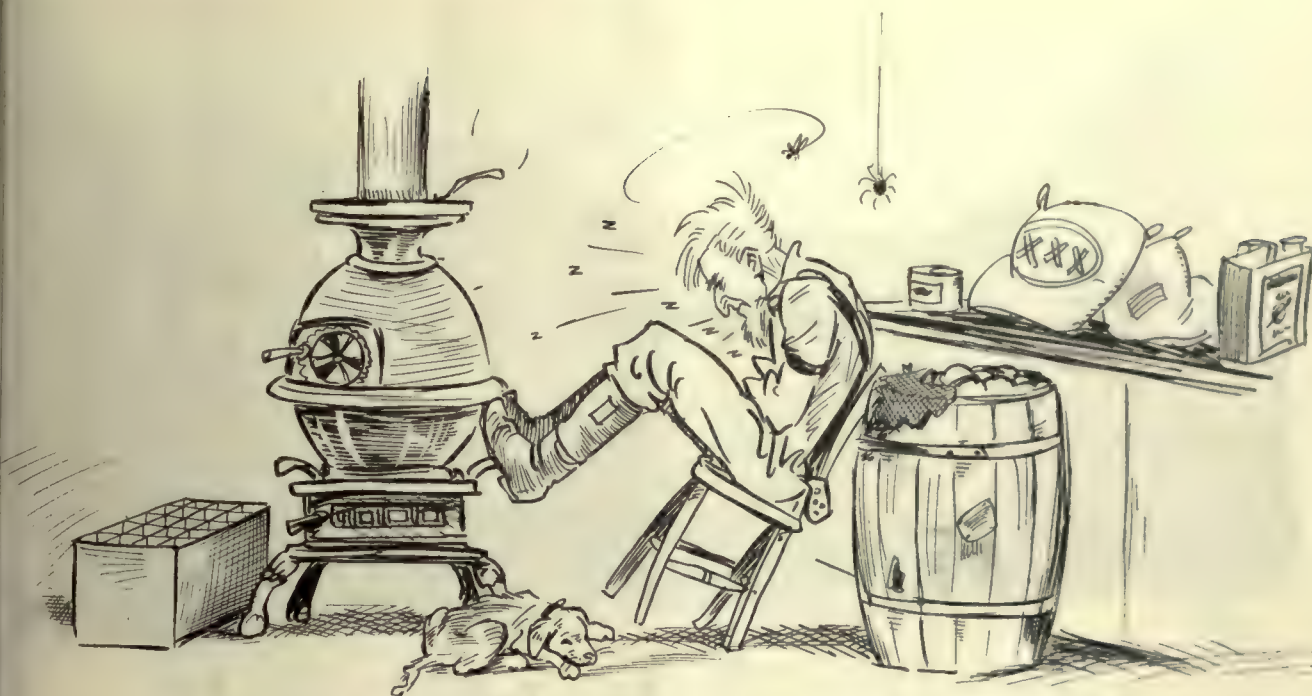
remain uncontrolled, but is used to automatically adjust the brake mechanism so that a corresponding increase in retarding force is made to assure the same stopping distance as before his extra weight was added. Each passenger thus unknowingly helps to safeguard and expedite his journey.

This modern brake for modern cars makes for safer and faster transportation, because uniformly short stopping distances are assured by virtue of automatic adjustment of brake cylinder pressure as the passenger load changes.

Equip your modern cars with modern brakes!

WESTINGHOUSE TRACTION BRAKE CO.
General Office and Works, WILMERDING, PA.

WESTINGHOUSE TRACTION BRAKES



Old Man Tradition

THERE is an old fellow who believes that what was good enough yesterday is good enough today. He winds his watch with a key and burns whale oil for light. His name is Tradition.

There is another fellow who knows that electric light is better and cheaper than whale oil. He knows that steel is a better structural material than wood. He buys Steel Twin Ties for his paved track work because he knows they're better, and cheaper. His name is Progress.

Twin Ties in paved track construction spell progress. Progress means improvement.

Are you progressing? Are you using Steel Twin Ties?

Write for delivered prices.

THE INTERNATIONAL STEEL TIE CO.
CLEVELAND, OHIO

Look it up in your "Paved Track Note Book"

Steel Twin Tie Track

TWIN TIES ARE ALL STEEL



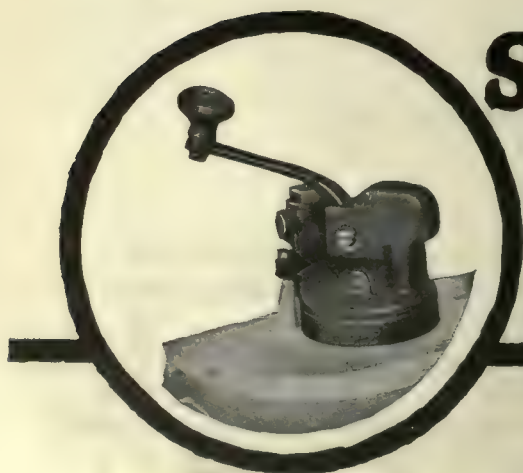
Significantly Named!

Many traction properties have named their cars, by popular vote, to memorialize citizens who have been outstanding in the development of the territory served by the electric railway lines.

While these cars are thus arbitrarily named, there are thousands of cars now in service today that by *nature* bear a distinctive name; they are called SAFETY CARS. Their character corresponds to that stipulated by the A.E.R.A. definition: "Any car equipped with adequate safety devices for one-man operation."

We make the Safety Car
Control Equipment
which makes the
Safety Car.

Safety Car Control Equipment interlocks the power, brake, and door control functions to combine ease and convenience for centralized operating responsibility, while providing assurance of adequate safety.



SAFETY CAR DEVICES CO.
OF ST. LOUIS, MO.

Postal and Telegraphic Address:
WILMERDING, PA.

CHICAGO SAN FRANCISCO NEW YORK WASHINGTON PITTSBURGH

Next Week *full details* *The Cincinnati* *Program for 1928*

〔 The Four Features of Balanced
Design are the Cardinal Points
of Today's Demand! 〕

CINCINNATI <sup>BALANCED
LIGHTWEIGHT</sup> CARS
— still a step ahead of the modern trend!



Designed for Severe, High-Speed Service

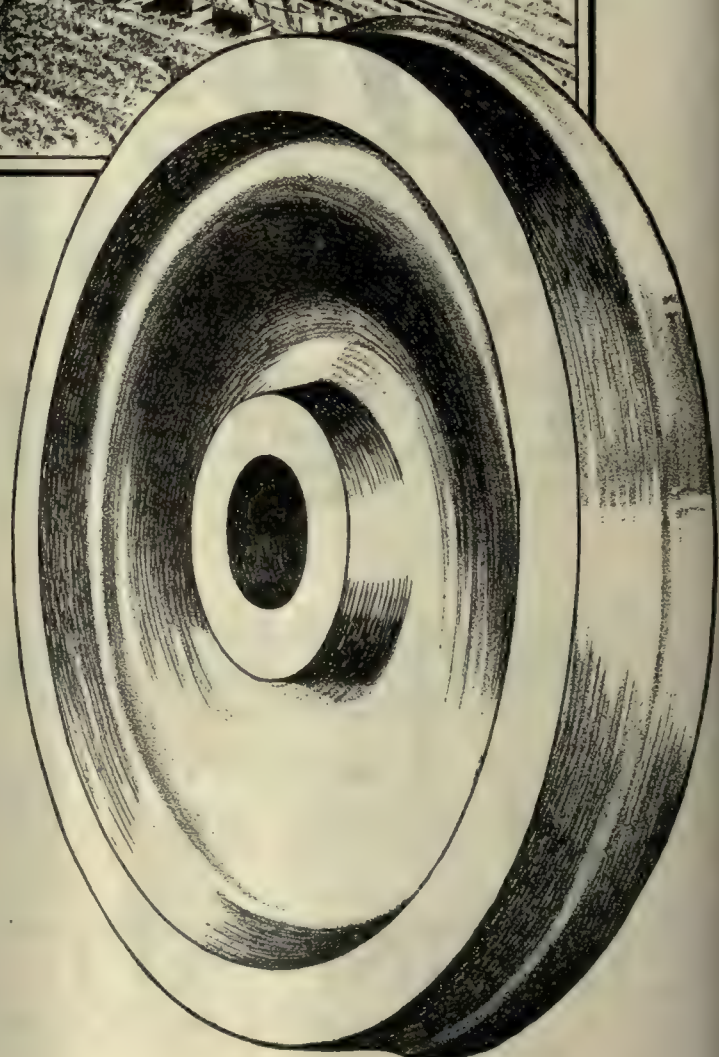
Ploughing its course at flying speed through the open stretches of the country, or nosing its way cautiously through the congested sections of the city, the interurban car demands the best there is in equipment,

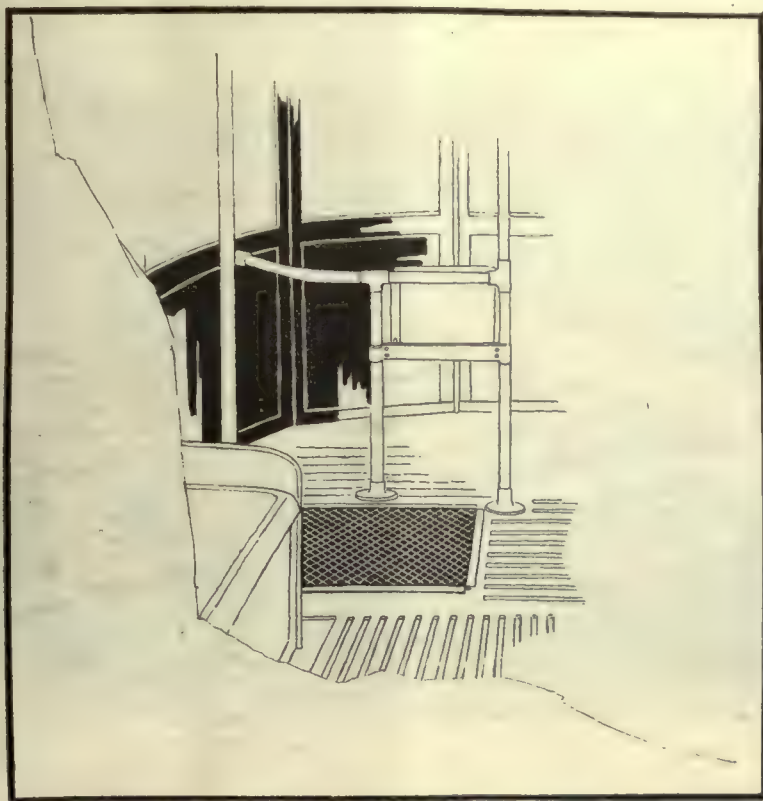
The wrought steel structure of Gary Wheels offers freedom from fractured flanges, cracked plates and chipped rims; rolled steel against rolled steel offers superior braking contact, especially appreciated in emergencies; and the principle of multiplied mileage offers an exceptionally low cost per mile of service.

*Our wheel engineers will be glad
to explain further.*

Illinois Steel Company

General Office:
208 South La Salle Street
Chicago, Illinois





A FEW SQUARE FEET WHICH SAVE YOU MANY DOLLARS

Ask any one of more
than half a hundred
properties what sav-
ings they have made
with—



AUTOMATIC TREADLE EXIT DOORS

NATIONAL PNEUMATIC COMPANY

Executive Office: Graybar Building, New York

General Works: Rahway, New Jersey

CHICAGO
518 McCormick Building

MANUFACTURED IN
TORONTO, CANADA, BY

Railway & Power Engineering Corp., Ltd.

PHILADELPHIA
1010 Colonial Trust Building



It seems but yesterday—

That electric railway operators had to sell themselves on the future of their properties

Definitely has the question, "Can the Industry afford new equipment?" been answered. Definitely, too, every prediction has been fulfilled. Old methods are no longer tolerated in the light of the successes which have attended constructive equipment betterment programs.

Tangible and intangible proof is available—better service, improvements in maintenance and in power costs, en-

thusiastic support of the public and press, a better feeling among platform men and other employees. These are accepted facts. *Electric railway transportation is being made to pay!*

Faith in the Electric railway as a basic means of transportation, as a public necessity, and as a sound investment for capital is being vindicated!

And all this seemingly since yesterday!

St. Louis Car Co.

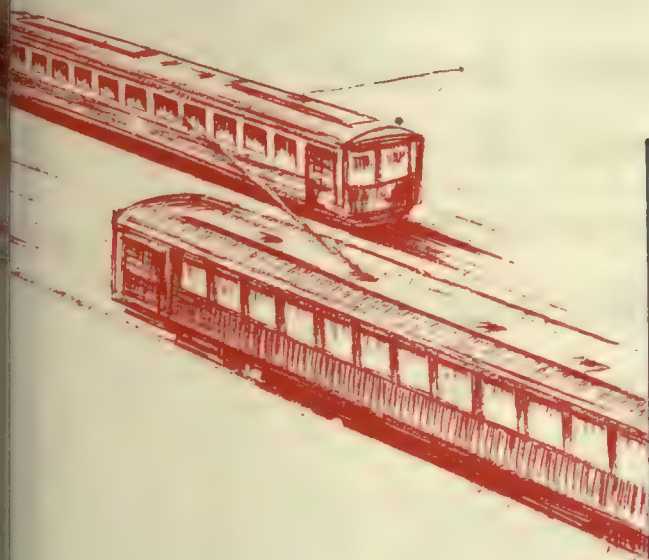


But Today—

They are on their toes for the greatest Electric Railway Convention in History

Small wonder then that the Electric Railway Industry is aroused to a high pitch of anticipation—that the coming convention promises to mark a new era in car development. By all means go to the convention! Send every man you can spare from your property! There is a new spirit abroad. There is definite evidence of progress. There is renewed confidence among both manufacturers and operators. There is a big idea for you at Cleveland. You can't afford to miss it!

The Quality Shops sense their obligation to the industry. Visual proof of their progressiveness awaits those who visit our Exhibit at Cleveland. It reflects the spirit of St. Louis.

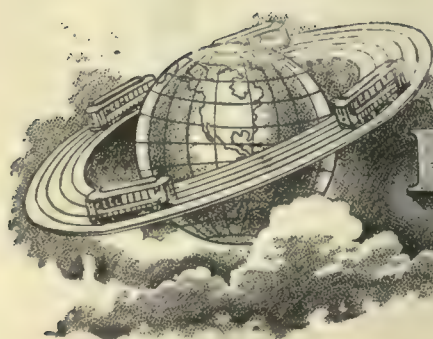


These questions will be answered at Cleveland

How do the Quality Shops express their interpretation of keeping community transportation up to date?

What does fitting the right car in the right place really mean?

JUST as the electric railway companies have to compile and be guided by exhaustive statistics as to peak loads, traffic densities, costs per mile, and so forth, we must constantly keep ourselves informed as to purchasing power, density of population and all vital market information in order to maintain our service as an active asset of your service.



Barron G. Collier

INCORPORATED

CANDLER BLDG. NEW YORK



YOU are assured of greatest strength — greatest durability — therefore greatest dependability when you build with *International* Creosoted Yellow Pine Poles. These poles are 44% stronger and the variation in strength of individual poles is much less than poles of other species. Creosoting under pressure resulting in a deep penetration of the preservative maintains this strength so they will carry heavy loads and withstand the strains of wind and sleet storms without failure.

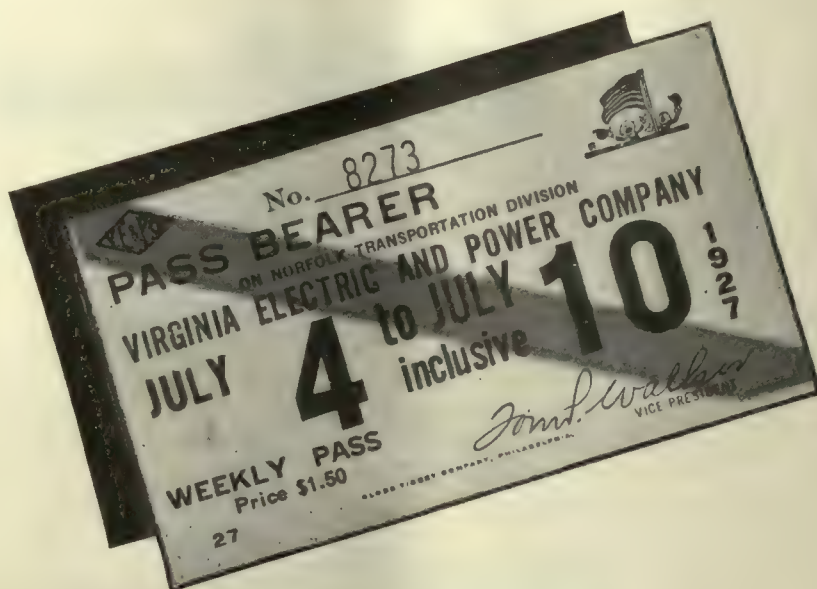
International Poles have proved their dependability as evidenced by the fact that *International* Poles in service over 28 years are still perfectly sound. Their reputation has been established in service.

International Creosoting & Construction Company
General Offices—Galveston, Texas



*International Creosoted Pine Poles in
Signal Service on the Big Four near
Indianapolis, Ind.*

International Creosoted Yellow Pine Poles



The Unlimited Ride, Transferable

WEEKLY

Sunday—Holiday—Off-Peak

PASSES

**Associated with Various Fares
of Short-Haul Type**

Provide the only means of combining more revenue to the operator with more usefulness to the public.

You cannot afford, in this era of competition from personal cars, to install any type of fare that reduces the number of your customers or that fails to make your service more agreeable. The pass eliminates change-making, tokens, identification slips and transfers. It speeds up your service, stimulates the riding habit and promotes better public relations.

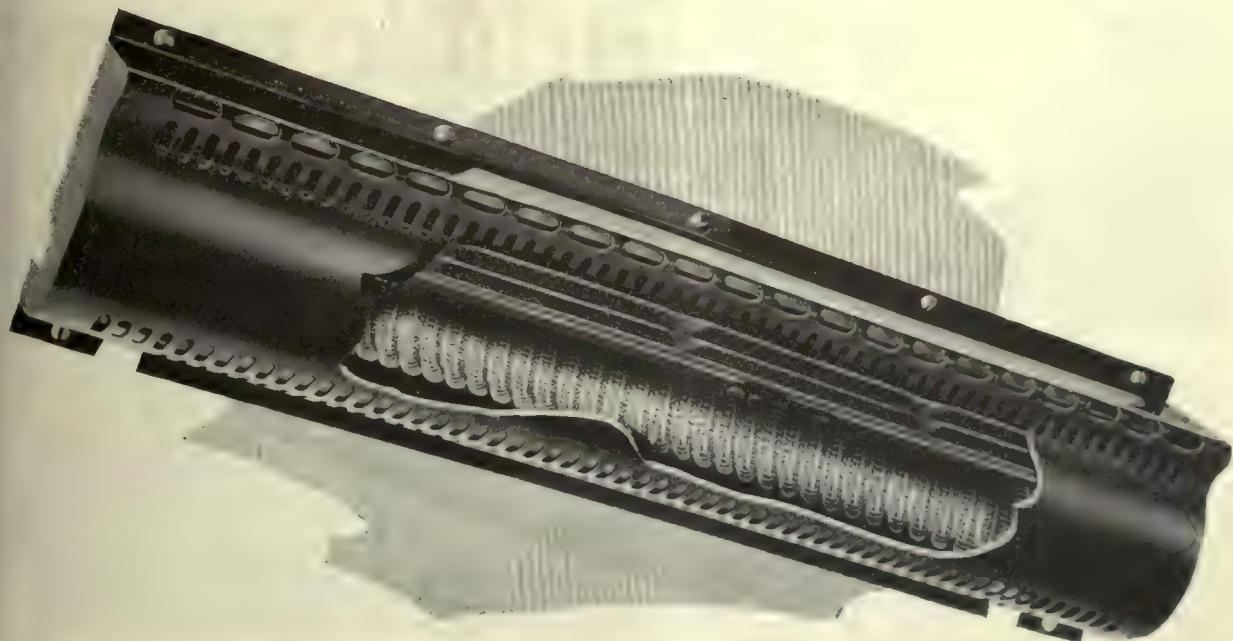
Write

Walter Jackson

Fare and Bus Consultant

160 Gramatan Ave., Mount Vernon, N. Y.

CONSOLIDATED



New Protected Open Coil Heaters

Made by the oldest and most dependable electric railway heater manufacturer, the *New Consolidated Protected Open Coil Heater* has important new safety features.

Heavy, non-corrosive wire coil permits free passage of air through heating element, run at low temperature, thus insuring long life of coil. The coil is bound to spindle by means of asbestos cord, which prevents it from leaving spindle in the event of breakage.

The new feature is the lowered guard which positively prevents contact with any live parts.

Protected Open Coil Heaters are furnished in Cross-seat, Panel, and Truss Plank Types.

Approved by the Underwriters' Laboratories.



CONSOLIDATED CAR-HEATING CO., INC.

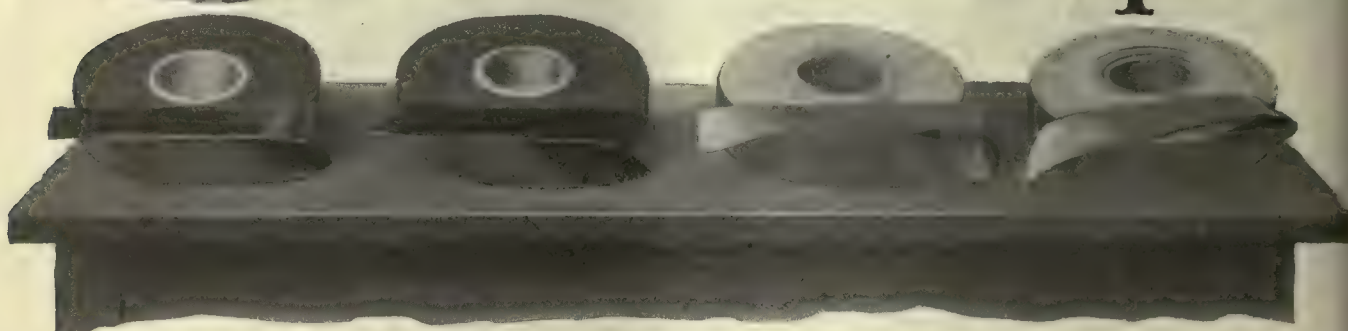
New York

Albany, N. Y.

Chicago



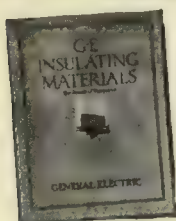
Why you will find it profitable to use General Electric Cloths and Tapes



Because General Electric has developed them to the highest quality, after thorough research. Because they are used by General Electric in the building of its own motors, generators, etc. Because the full line is quickly available to you from your local G-E Merchandise Distributor. Because it's good business to repair equipment with Varnish-treated Cloths and Tapes that will make it stand the strain of your severe service conditions.



IN THIS CATALOG



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- Varnish Treated Cloth Tapes
- Insulating Fibers
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- Motor Tubing
- Asbestos and Cotton Tapes
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G-E Varnish-treated Tapes are cut from G-E Varnish-treated Cloths and are therefore of the same high quality. Any desired width from $\frac{1}{2}$ inch up in all desired thicknesses. Colors—black and yellow.

G-E Varnish-treated Cloths and Tapes are made from a base cloth free from either starch filler or acids. Nothing is added to the cloth which might prevent thorough penetration in treating with G-E Insulating Varnishes. The result is a cloth of *continued high dielectric strength* in service.



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GENERAL ELECTRIC

MERCHANDISE DEPARTMENT, BRIDGEPORT, CONNECTICUT

Electric Railway Journal

Consolidation of Street Railway Journal and Electric Railway Review
Published by McGraw-Hill Publishing Company, Inc.
CHARLES GORDON, Editor

Volume 70

New York, Saturday, September 10, 1927

Number 11

Co-operation of Manufacturers Will Insure Interest in Car Exhibit

WORD went out some time ago from the committee on co-operation with manufacturers calling attention to the importance of capitalizing to the utmost on the value of this year's car exhibit. Facilities for showing cars are better in Cleveland than they have ever been for an electric railway association convention. In the opinion of the manufacturers' committee, therefore, it is important that all manufacturers co-operate to insure that the maximum value be derived for the industry from the showing of cars while there is the opportunity.

The committee suggests that all manufacturers, whether or not they are directly interested in the production of cars or car parts, help to insure adequate attendance of visiting delegates at the car exhibits. The job is simple. First look at the cars yourself and study the development shown. Then talk about them to every delegate who will listen. Finally, urge the railway man who visits your booth, after he has seen your own exhibit, to be sure to inspect the new cars on display. Better still, if you can do so take him out personally to see the cars. Talk about them and point out the new things of interest. You will be doing something not only for the industry, but you will get a better understanding of the general situation and of the progress being made.

Ship Early to Exhibit Intelligently

IN THE ISSUE of this paper two weeks ago was published a résumé of the shipping instructions sent out by the exhibit committee for the Cleveland Convention in October. They were clearly detailed and they need no further comment. It is not in the method of shipping that a possible danger lies to the ultimate success of the exhibit, but rather in the question of early shipping and erection. One has but to recall the helter-skelter confusion of the first days of some of America's biggest exhibitions to have this evil of late shipping forcibly impressed upon the mind.

The exhibit that is partly completed after the official date of opening receives scant attention from early visitors. "I'll come back here later," they say—and then they don't. The whole business leaves a bad taste in the mouths of those for whom the exhibit is specially designed. By Friday evening, Sept. 30, every exhibit at Cleveland should be completed, and by noon on Saturday, booths must be ready for the visitors' inspections.

Since last October the exhibit committee, from Colonel Alexander and Director Fred Dell down, has worked unceasingly to make the 1927 show an outstanding success. Unless one is familiar with the ramifications, the mass of detail and the real generalship necessary to promote a pageant of this character, he cannot appreciate the importance of complying with every suggestion contained in the committee's shipping and arrangement instructions, especially as at this moment the industry

stands on the threshold of a new era of development in which the manufacturer will play a tremendous part.

In this connection for manufacturer and operator alike the JOURNAL can think of no better advice than that given by the Bard of Avon: "There is a tide in the affairs of men which, taken at the flood, leads on to fortune. . . . We must take the current when it serves or lose our ventures."

In other words, the tide of progress in our industry is at the flood of progressive ideas. Concretely expressed in exhibits these ideas may be weighed in the balance at Cleveland, if they are presented at the psychological moment. The half-filled booth, the confusion wrought by saw and hammer, will not contribute to an adequate presentation or a sober contemplation of these ideas. Ship early to exhibit intelligently.

Duplication, Alternation, or Co-ordination

HOW best to fit the bus into the general transportation scheme in the territory served by Public Service Railway of New Jersey has long been a difficult problem. Bus operation originally was developed by independent owners and no effort was made to avoid duplication of facilities already existing. On the contrary, practically every bus route was laid out with the deliberate intention of stealing the cream of the traffic from some railway route. This bus business expanded rapidly until the State Legislature passed an act which more or less checked further increase in the number of buses. The number in operation at the time of the passage of the law was so large, however, that the competition was ruinous to the railway.

Several years ago the parent company, the Public Service Corporation, with a view to co-ordinating rail and bus operation, organized the Public Service Transportation Company as a bus-operating subsidiary. Hundreds of the independent operators were bought out, but a small number demanded such exorbitant prices that the company declined to purchase their equipment and rights. The mixed ownership of buses was a stumbling block in the way of real co-ordination. It was obvious that improvement in transportation facilities could be accomplished by removing the buses to streets other than those on which the railway operated its cars, but the independents objected to any such change. A certain part of the public found the duplication of service to be convenient, and they also opposed any change.

Difference in the rates of fare on the cars and buses further complicated the situation. The independent buses, free of most of the financial burdens imposed on the railway, were able to give service at lower fares. On routes where this could not be done, the buses did not operate at all. The lower fare on the buses was a potent influence behind the public opposition to any change in route.

In this situation the best that the company was able to do was to develop a system of alternation. Schedules

were arranged so that cars and buses operating on the same streets alternated with each other instead of running side by side from one end of the route to the other. This gave an even headway shorter than that which had previously been given by either the cars or the buses, and made it possible to save a certain amount of duplicate vehicle mileage. The result, however, was far from being a real solution of the transportation problem.

Recently a comprehensive survey of the whole transportation system in the city of Newark was made for the mayor by the engineering firm of Parsons, Klapp, Brinckerhoff & Douglas. An abstract of the report appears elsewhere in this issue. It goes straight to the heart of the matter and states unequivocally that there is no need for duplication of service on the same streets in this territory. Rerouting of buses to serve districts lying between the railway lines is recommended. Equalization of fares is emphasized as a necessary adjunct to this scheme.

Many other interesting points are touched upon in this report. Without minimizing the importance of the other phases, it may be said that the recommendations for co-ordination of bus and railway service are the outstanding features. These recommendations are now before the municipal authorities and it is to be hoped that active steps may soon be undertaken to bring about this desirable improvement in transportation facilities.

The Stone That Was Rejected

MICHELANGELO'S wondrous representation of young David was said to have been cut from a stone spoiled, rejected and abandoned as worthless by an unskilled workman. Many passed by this fine specimen of Carrara marble as it lay among the waste and rubbish on a street in Florence until the sculptor saw the beauty within. Likewise out in Kansas junk seemingly useless awaits only the touch of the reclamer endowed with patience and skill sufficient to convert it into a thing of real utility.

Some twenty years ago this so-called interurban was placed in service. According to recent indictments, apparently well justified, its equipment and appurtenances, only lately retired from service, are reminiscent of that day. The road had never boasted a new car since its inception. When so-called new rolling stock did appear, it was transported from other properties willing to strike a bargain over second-hand equipment. That this floundering project would succumb in a flood tide of de luxe cars, fast schedules, trained employees and willing managements was inevitable. The enigma of a broken-down, neglected railway in the present era will answer partially, though belatedly, William Allen White's question "What's the Matter with Kansas?"

But a day of atonement may yet come for the sins of omission and commission on the part of this railway management, whether culpable or not. Efforts are being made to restore the service largely on the faith that local people have in the line. In this scrap heap there appears to lurk material replete with possibilities for creating a railway system which gives promise of serving all the better for its having been almost ruined. If in capable hands a thing of beauty can be made from material seemingly marred beyond redemption, may not a defunct railway, said to have failed not because of lack of patronage but through "ultra-conservatism," be fashioned into an up-to-date utility? There are many instances to prove

that this hope is not unreasonable. And as the unveiling of "David" caused a great sensation, so may the hoped-for resumption of this road be celebrated with the appearance of de luxe cars ushering in a new régime with its shibboleth, "satisfied customers."

Another Good Report from Toronto

PROBLEMS not unlike those experienced in the conduct of private companies confront the municipality that attempts to run its railway system. This is apparent from the report of the Toronto Transportation Commission, digested elsewhere in this issue. The statement on the whole makes a very creditable showing. The commission, however, has felt called upon to issue a warning that extensions into unprofitable areas cannot be made without danger of having to raise the fare. A growing city with new suburbs and new subdivisions creates a problem in transportation. Householders are loath to move into a section not conveniently served by cars. The agitation for service grows and by and by must be met. As the *Toronto Globe* points out, if the commission supplies a service too soon, it will lose money, the deficit will pile up and cause borrowing. Borrowed money requires additional funds for the payment of interest. Thus the vicious circle grows. On this point the commission says:

One of the most difficult conditions your commission has to meet is the constant demand for extensions of its rail lines and bus services into localities from which practically no additional revenue can be derived. While your commission recognizes its obligation as a publicly-owned utility to provide city-wide service, yet it must have regard for fundamental economic considerations if the present rates of fare are to be maintained. The revenue from the universal fare system has varied only slightly from year to year. The problem of administering the system would be greatly simplified if there were a moderate and consistent yearly increase in revenue.

The *Globe* also shows that the system on an average fare of 6.16 cents pays its way, provides for depreciation, wipes out almost \$1,000,000 yearly on "intangible assets" for which the city had to pay in acquiring the system, and has a surplus of \$76,961, or a little more than one half of 1 per cent on the gross income.

This, of course, is a comfortable but not a buoyant condition. The competition of private motor cars constantly cuts into revenues and it is not likely to decrease in the slightest. As the commission has made plain, improved business conditions contributed last year to the increase in revenue. Despite this, however, 5,500,000 fewer passengers were carried in 1926 than in the record year established in 1923. The increase in gross income over 1925 was partly due to the increased development of motor coach traffic and partly to the aforementioned improvement in the general business conditions in the Toronto district.

A difficult condition confronted the commission from the very inception of the municipal system. Money has been spent with a free hand, but one not too free. The conclusion of the *Globe* seems to be sound that for the immediate future the commission appears to be on safe ground without disturbing the fare. The service, generally speaking, is highly creditable. The personnel is, indeed, very able, but it never could have done the things it has done had it not been unusually free from political interference. In short, an able management has been left largely untrammelled, a condition under which the greatest success is assured by approximating the conditions of private enterprise.

What European Departmental Organization May Teach Us

SEVERAL articles in recent issues of this paper on European street railway practice suggest the question whether railway companies in this country can learn much from foreign methods. In view of the far greater extent of electric railway development in America than in any other country and the ready exchange of information, is it not probable that Americans already know the best methods of electric railway operation?

Undoubtedly in number of miles and cars in operation, America leads other nations, but size is not necessarily synonymous with quality or even with opportunity for progress. For example, in the United States, the field of electric railway operation is so large that much of the manufacturing can be done in comparatively large quantities. This makes the employment of standardized equipment almost obligatory from an economic standpoint. But in Europe, because of high tariff walls, each country is largely dependent on its own production, and the demand for electric railway equipment in each is comparatively so small that the same advantages cannot be gained from standardization. Hence there is greater diversity of practice, and possibly for this reason more opportunities of finding a new and better way of carrying out a certain task. In the form in which this method is used abroad it may not be always directly applicable to American conditions, but it may often suggest a method which would be suitable.

The leading European article this week relates to company organization. Most American managers are accustomed to think that a company organization must be largely along certain lines, but here is a railway company with the responsibilities grouped in quite a different way, yet functioning very successfully. Briefly, there are only three general departments, which may be defined as (1) financial and secretarial, (2) operation and engineering, and (3) legal and executive. In this country, the first and second would be divided into at least two each, often with three or four departments to cover "operation and engineering."

A second interesting feature of the Paris organization is the position given in the departmental arrangement to research work. There are two independent research departments, each along quite separate lines. One handles transportation methods and also has the duty of compiling the schedules. But in both this and its transportation research work it is entirely independent of the transportation department, reporting directly to the manager of operation and engineering. The other research department is devoted to technical research, and it is as independent of the engineering department as the department of transportation research is independent of the transportation department.

From the American standpoint there may be some objections to this plan, but at least it seems to give both research departments a freer field for action than if that devoted to transportation research reported to the superintendent of transportation and that on technical research reported to the chief engineer. This latter plan, usually followed here, means that recommendations for a change in either engineering or transportation methods, based on research, have to originate in the department concerned; in other words, they become essentially the criticism of a superior by a subordinate. In the more inde-

pendent departmental arrangement used in Paris, this objection does not hold. In practice, it may not be a serious one, but it is worth considering. Still another interesting feature in the organization is that departments or sub-departments to discover better ways of doing things are not confined to transportation and engineering. The executive department also has its research department, although its duties, as explained in the article, are not confined to studying new and better ways of carrying out administrative work.

The Battle of Smoke

SHOULD passengers on the street cars be allowed to smoke, or should the present rule against smoking be kept in force? In this manner *Two Bells*, the leaflet distributed on the cars of the Georgia Power Company, presents to its readers an old problem for discussion. The Atlanta company is asking for expressions of opinion on which it may base its decision to retain or amend the no-smoking rule. Years ago smoking was permitted under certain conditions. The no-smoking rule was adopted to please the majority of the car riders, but that was when few gentlemen and no ladies smoked in public. Now times and customs have changed and perhaps the opinion of the majority is different.

Atlantans are taking considerable interest in the controversy and are sending in many letters. Strange to say, most of the replies evade the main question to discuss a secondary one, the feminine angle of the referendum. A typical correspondent states, "Though I am too old to be classified a flapper I am not opposed to women smoking and I should like to ask, if the no-smoking rule were abolished, would ladies be permitted to smoke on the cars the same as men?"

The objectors are even more emphatic than those in favor of the change, as witness:

"What! Permit smoking on the street cars? I should say not! How would you like to sit next to a man who was smoking an old pipe or a cheap cigar?"

Although the subject is live at present in many cities it is not new. From an operating standpoint it is highly undesirable to set aside sections of a car, or worse still entire cars, for smokers, since it makes it difficult to distribute the load. There is also the problem of maintaining a smoking compartment in a sanitary condition. Patrons who advocate the no-smoking rule further maintain that smoking and carrying smoldering cigars, cigarettes or pipes in a car is improper and unreasonably unsafe. Some go further and hold that aside from the danger of filling the eyes and throat with smoke and subjecting clothing to sparks the habit has a baneful influence on "ethical purity." Smokers, on the other hand, claim that these arguments are not valid and that since they are in the majority the majority should rule.

Two Bells made a worthy comment on the argument in its opening statement, "This is going to be the battle of smoke, with plenty of the smoke of battle." While it may be settled there always will be the difference of opinion, as voiced on one side by those who hold that it is "the inalienable right of mankind, as guaranteed by the Constitution and the laws of the land, to breathe fresh and pure air, uncontaminated by unhealthful and disagreeable odors," and on the other side those who maintain "the inalienable right of man to indulge in a good Havana."

Central Business District of Newark, N. J., as Seen from the Air



Solid white line shows the route of the Morris Canal which will be converted into a trolley-subway station between the Pennsylvania Railroad station and Bloomfield Avenue, with intermediate entrances and exits for cars operated on connecting lines. Dotted line shows the proposed trolley-subway to be built later under Broad Street from Washington Park to Clinton Avenue. It is

proposed to extend the Hudson & Manhattan tube service to a new station near the intersection of the north-south and east-west subways.

- A—New Pennsylvania Railroad station.
- B—Public Service Terminal.
- C—Proposed H. & M. station.
- D—Present H. & M. station.

Photo by Fairchild Aerial Surveys, Inc.

Transportation Survey

Made in Newark

Rerouting of buses to reduce duplication of service, equalization of fares and curtailment of parking are recommended in engineers' report. Desirable development of rapid transit facilities outlined

FROM the traffic and transportation standpoint as well as economically and commercially, the city of Newark, N. J., is an integral part of the New York Metropolitan area. With a population of 465,000, together with widely diversified industrial and commercial activities, it ranks as the most important sub-center in this district. At the same time Newark is a fully developed city, with its own business and residential areas, and must be considered also as an independent center. Transportation problems arising from this situation have been the subject of several months study by Parsons, Klapp, Brinckerhoff & Douglas, engineers, New York, N. Y., and a comprehensive report recently has been submitted to the municipal authorities.

To further the growth of Newark as a business center, the report states that three distinct classes of service should be developed: First, a local service of existing buses and trolleys, confined essentially to Newark and the immediate vicinity; second, a de luxe or semi-de luxe bus service operated to towns and cities outside of Newark and centering in the business and shopping districts; third, a rapid transit system arranged to co-ordinate with the local trolley and bus systems and with the commuter service on the steam railroads and the Hudson & Manhattan tubes.

REROUTING OF BUSES NEEDED

On the main thoroughfares in and out of the central business district of the city the report states that trolleys now carry approximately 34 per cent of the total traffic, buses 33 per cent and passenger automobiles, including private vehicles and taxicabs, 33 per cent. Traffic checks, however, show heavier loading of the buses than of the trolleys on a number of routes where both occupy the same streets. That trolleys and buses are operating on the same street is due largely to the original creation of the bus service as an independent competitive system and partly to the effort made to supply service by buses during the trolley strike several years ago. According to the report there is no necessity in a territory of this extent for the concentration of two classes of transportation upon the same street.

All transportation facilities must be utilized in the most efficient and effective way if the present 5-cent fare within the city limits is to be maintained. This means a co-ordination of both railway and bus service, so as to load them uniformly without overcrowding. The report states that 80 per cent of the passengers using lines entering the downtown district want to be delivered along Broad or Market Street. For that reason the greater part of the service of both cars and buses must be con-

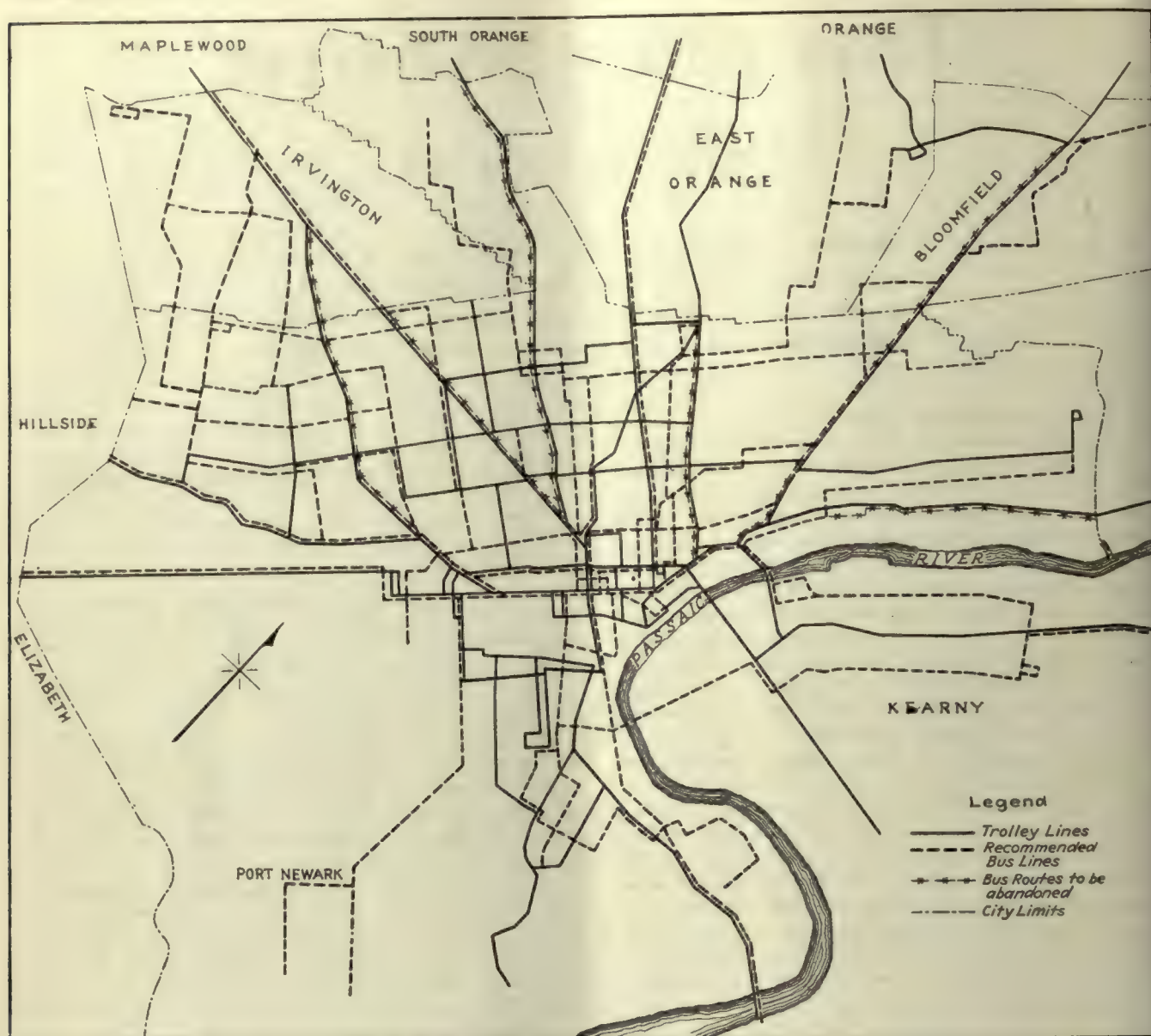
tinued along those thoroughfares, the engineers declare. In the outlying residential districts, however, greater convenience to the passengers and more equal loading of vehicles could be obtained by shifting some of the buses to other streets parallel to their present routes. This would divide the districts between existing trolley lines by bus routes traversing sections not directly served at the present time. With schedules properly adjusted this rerouting would tend to relieve overcrowding by a better distribution of the loading between buses and trolleys and bring utilization of both vehicles to a more even balance. Present and recommended routes are shown on an accompanying map.

Full benefit of such rerouting, however, cannot be developed until an equal fare is charged on both bus and trolley lines serving the same territory. On account of the irregular outline of the city a number of lines well located for the convenience of the public traverse portions of Newark and one or more urban communities. The older trolley lines have established fare zones, corresponding generally with the limits of Newark. The newer bus lines, on account of their original competitive operation, have a single fare, against a double fare on the trolley, although both are now operated by the same company. Equalization of these fares is considered by the engineers to be of prime importance.

The question of adequate service must be considered in relation to the fare. The report states that it cannot be hoped for a 5-cent fare to give a seat to every passenger on zones of such length as occur in this system. During rush hours a reasonable number of standees must be carried. Moreover, if enough buses and trolleys were operated to give a seat per passenger congestion would be so increased that they could not get through the streets at reasonable speed during the rush hours.

PARKING RESTRICTIONS RECOMMENDED

Progressive steps must be taken by the city authorities to eliminate parking at critical points in the interests of the general traffic movement in these localities. Critical points occur opposite the passenger loading platforms of the trolley cars, where the width of the street is less than elsewhere. Parking along the curb opposite these loading platforms is contrary to ordinance. Observation of existing conditions indicates, however, that automobiles are sometimes parked the full length of the curb opposite loading platforms. This restriction should be extended 30 ft. beyond the ends of the platform, and steps should be taken to see that the regulation is observed. Double parking is also contrary to ordinance and should be stopped.



A tabulation in the report indicates that 86 per cent of the automobile drivers observe the one-hour parking limit. If the 14 per cent violators had observed the ordinance, the curb line space which actually accommodated 9,679 cars would have accommodated 14,625, an increase of 51 per cent. Better observance of the ordinance, it is said, must come from force of public opinion, as the police cannot at any reasonable expense keep track of every car at all hours of the day.

Traffic conditions on Broad and Market Streets have been the subject of special study. Broad Street from Lincoln Park to Washington Park and Market Street from the Court House to the Pennsylvania Station constitute the two heaviest traffic streets in Newark and their intersection is the heart of the shopping, financial and business district. The vehicular traffic over this intersection is equal to and on some days exceeds that at Fifth Avenue and 42d Street, New York City. It is stated that a twelve-hour traffic check at this intersection between 8 a.m. and 8 p.m. on July 23, 1926, showed 30,828 vehicles crossing, comprising street cars, buses, automo-

Present car and bus routes in Newark, N. J., and changes as recommended in report made recently by Parsons, Klapp, Brinckerhoff & Douglas. It is proposed to shift the bus routes in the outlying districts to streets on which no cars are operated, thereby eliminating much duplication of service and also accommodating additional territory. No changes are recommended in existing car routes.

biles, taxicabs and trucks, carrying more than 205,000 persons. The vehicles were divided as follows: Street cars, 2,623; buses, 4,412; automobiles, 17,015; taxicabs, 1,565, and trucks, 4,713.

Any obstruction of these streets which cuts off a lane of traffic necessarily delays all of the passengers in some degree, the report states.

During rush hours parking probably causes at least five minutes delay to each passenger. This means a loss of more than 12,000 man-hours every weekday on these two streets. A check of the speed of cars and buses on Market Street from the Court House to the Pennsylvania Railroad Station, Dec. 20, 1926, compared with a similar check during the evening rush hour made Jan. 27, this year, when parking was prohibited, showed a time saving over this route of 2.34 minutes on the trolleys and 2.14 minutes on the buses, due to the increased freedom of vehicular movements on the later date. A substantial increase in speed was shown also by the buses on Broad Street. All automobile traffic on both streets was greatly accelerated.

A comprehensive view of Newark's transit situation,

the report states, must recognize that before many years a subway either for rapid transit trains or for preliminary use by street cars will be required under Broad Street, at least from Clinton Avenue to Washington Park. Rapid and convenient transportation free from surface traffic interferences will be required to develop Newark's business districts between the above-mentioned parks. Such a section of subway if used at first for trolley cars will ultimately serve as a rapid transit route.

Purchase of the bed of the Morris Canal, the report continues, established the obvious east and west rapid transit route. Development of this line between the Pennsylvania Station and Bloomfield Avenue is recommended as an initial step, with possible extension later. This should be designed for use as a trolley subway, although it will ultimately be required for rapid transit trains. The extension of the Hudson & Manhattan tubes to a terminal under Military park is proposed to give a three-point delivery for that service at the Pennsylvania Station, the proposed station at the southerly end of the city, and the terminal under the park. This, the report declares, would relieve rush-hour congestion.

Construction of a terminal under the park is important because it is the only point at which a general transfer station can be established from which any section of Newark can be reached with a single change. Eventually it would become the intersection of the subways in Broad Street and the canal bed. The proposed terminal site, the report points out, is the heaviest loading point in the city at the present time. A suggested arrangement of facilities at this location is shown in an accompanying drawing.

A modern subway built through the central portion of a large city is the most expensive form of construction for a rapid transit line. In certain districts, however, where street congestion and pedestrian traffic have grown beyond the capacity of the surface thoroughfare, a re-

course to subways, however expensive, becomes necessary. The great cost per mile of such structures can be justified only by great density of traffic providing a revenue to support them unless the city finds it necessary to construct subways to provide convenient access to its congested districts because of the insufficient street capacity. The report points out that expenditures for a subway system must be justified as self-supporting or must produce a return to the city by increase in property values and consequent larger tax revenue. A study of the city boundaries of Newark shows that its width east and west is not great, and to tap many of the outlying districts would require extension into the territory of other municipalities. As they would participate in the benefits from rapid transit development, they should also participate in the financial burden.

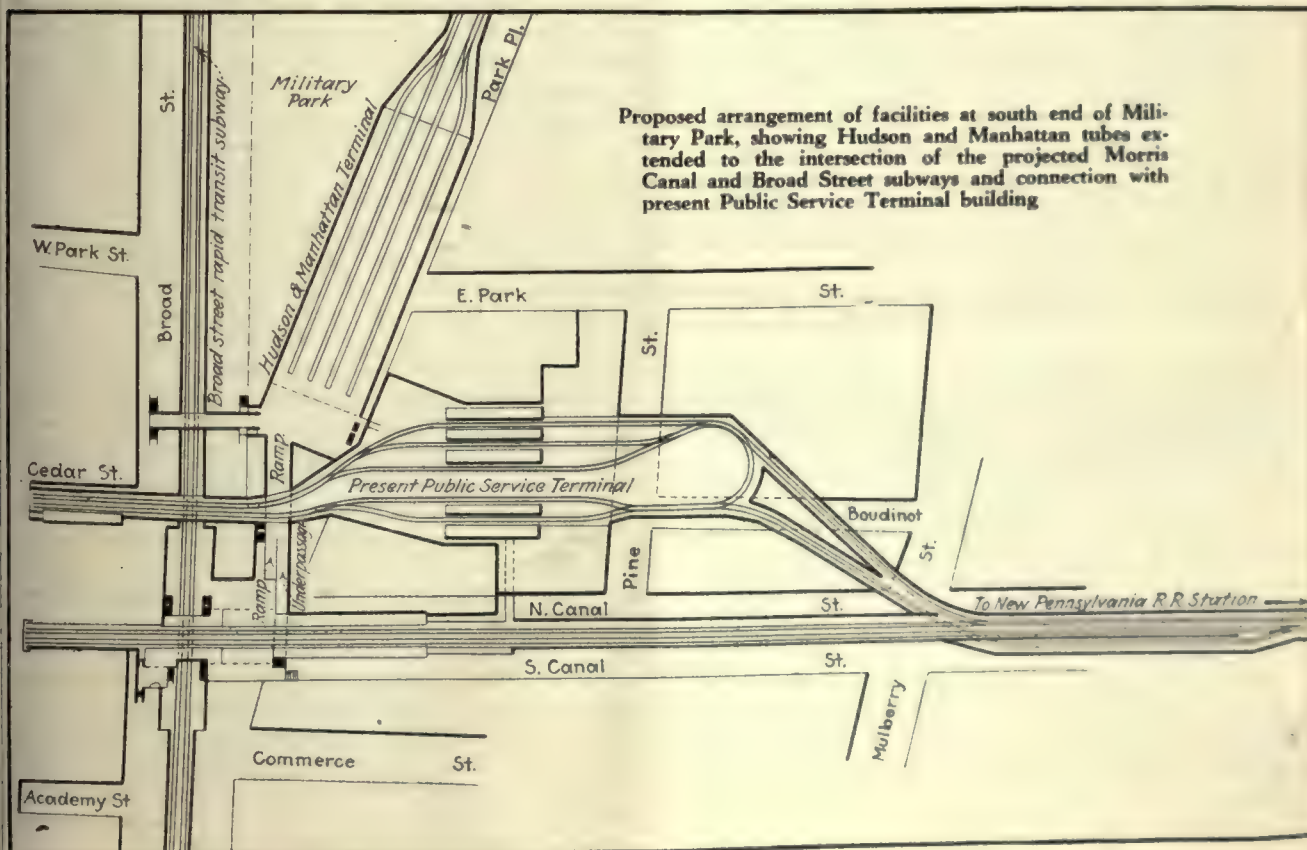
Rapid Track Reconstruction in St. Louis

Widening of Olive Street necessitated the relocation of 3.35 miles of double track without interruption to service

By C. L. HAWKINS

Engineer of Way and Structures
United Railways of St. Louis

DURING the past winter the city of St. Louis took possession of property condemned for the widening of Olive Street, one of the most important arteries leading into the business district, and workmen recently completed the removal of buildings from the area condemned. Double tracks of the United Railways are located on this street and the improvement necessitated extensive changes in the location of these tracks.

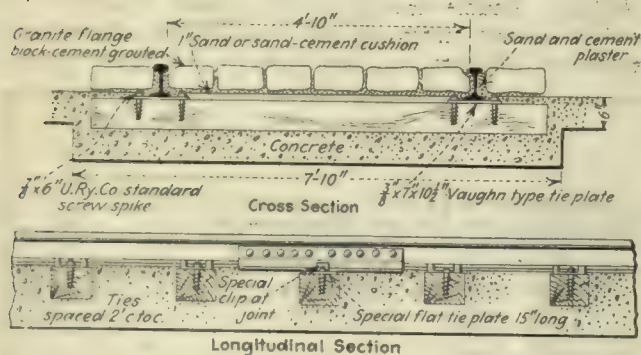


Formerly the width of the street between property lines was 60 ft. with a 36-ft. roadway and 12-ft. sidewalks. The new width of the street is 100 ft. between property lines with a 76-ft. roadway and sidewalks of the same width as before. A total length of 3.35 miles of double track was relocated at a cost of \$276,250.

The tracks were of 9-in. Lorain section No. 440 rail, weighing 132 lb. per yard, laid in 1915 on 7-ft. cypress ties in solid concrete foundation laid in 1906. The rails were laid on $\frac{1}{2}$ -in. x 6-in. x 11-in. flat tie plates with malleable iron clips and $1\frac{1}{4}$ -in. x 6-in. screw spikes, $\frac{7}{8}$ -in. round tie rods and 16-rivet Nichols composite joints. These rails carried approximately 4,000,000 cars prior to their removal, while the foundation carried approximately 6,225,000 cars. It is estimated that the rails, if



Widening of Olive Street, St. Louis, necessitated the relocation of 3.35 miles of double track of the United Railway



Granite blocks, Vaughn tie plates, screw spikes and Nichols 10-rivet joints are features of the new track laid on Olive Street, St. Louis

left undisturbed, would have been good for eight years more. After removal they will be used for minor repair work on other tracks.

New tracks were laid on a center line 20 ft. south of the old center line. This left 5 ft. between the gage line of the north rail of the new westbound track and the gage line of the south rail of the old eastbound track and permitted the construction of the new double track without disturbing the old. Rails are 100-lb. A.R.A. series "A" tee section, laid on adzed and drilled 6-in. x 8-in. x 7-ft. 4-in. white oak ties. Vaughn tie plates are used with four lugs bent down over the rail base. Spikes are $\frac{7}{8}$ -in. x 6-in. screw type. There are no tie rods. Joints are Nichols composite 10-rivet type. A solid concrete foundation is used with the concrete brought up to the top of the ties. The tracks are paved with granite, flange blocks being used along the rail. The area which

the railway is obligated to pave is 12 in. wide and the blocks are 12 in. long, laid at right angles to the rail.

Excavation for the southernmost or eastbound track was made with an electrically operated Thew shovel, which loaded the dirt into 5-ton Pierce-Arrow dump trucks standing on the pavement between the old eastbound track and the old south curb of the street. The contractor furnishing the dump trucks kept nine of them in service during a large part of the job and was paid for his services on the basis of yardage handled. The trench behind the shovel was finished by hand. All work on the new eastbound track was done without interference to traffic on the old double track and with little disturbance to the use of the old roadway.

Concrete in the eastbound track was allowed to set for approximately two weeks before work was started on the construction of the new westbound track. After that eastbound cars were operated over the new track and the Thew shovel began excavating a trench for the new westbound track, loading the dirt directly onto cars standing on the old eastbound track. In other respects the method of procedure was the same as for the track first built.

WORK DONE IN THE TWO NINE-HOUR SHIFTS

Two shifts of nine hours each were used on this work, the first starting at 5 a.m. and quitting at 2:30 p.m., while the second began at that hour and stopped at midnight. Work was begun on the eastbound track on June 8 and was completed, including pavement, on July 1. This work included some grading and some special work required for construction of the westbound track. Work on the latter began on July 18 and was completed, including paving on Aug. 4, making a total of 42 days for the construction of 3.35 miles of double track, or $12\frac{1}{2}$ days per mile of track, including paving.

The new westbound track is located just north of the curb of the old 36-ft. roadway of Olive Street. The new eastbound track is located within the old sidewalk space on the south side of the street. While practically all of the buildings in this area were business houses, only 30 ft. of the new eastbound track is located over old cellars under the former sidewalk. In the 40-ft. strip on the south side of the street the city has kept inspectors on the scene during the wrecking of buildings to see that only clean material, free from wood, building paper and other trash was used for filling in the cellars. No clay was permitted to be used in the filling process. By this careful inspection it is hoped that a foundation has been secured that will not settle materially.

Contracts for paving the roadway outside of the railway area was let by the city on July 26. Work started soon thereafter and it is hoped that the south roadway and south sidewalk will be finished before cold weather interferes. During the construction of the south half of the street westbound cars will be operated over the old westbound track and eastbound cars will be operated over the new westbound track. This will leave the new eastbound track as a landing space for passengers and make unnecessary the construction of temporary loading platforms. The old westbound track will be out of service because portions of it must be removed to permit the installation of manholes for telephone conduits centered under the new westbound track. All conduit manholes are so built that the entrances are far enough away from the tracks to permit pulling in or out of cables without interference with the operation of cars.



The Prince of Wales and Vice-President Dawes transferring from their automobile to the Ondiara for the Niagara Gorge trip

Royalty Visits Niagara Gorge

International Railway was host to the Prince of Wales, Vice-President Dawes and others. The trip was safeguarded well by the company

WHEN his Royal Highness, the Prince of Wales, his brother, Prince George, Prime Minister Stanley Baldwin of Great Britain, Secretary of State Kellogg, Vice-President Dawes and other officials representatives of England and the United States attended the dedication of the new \$4,500,000 Peace Bridge across the Niagara River from Buffalo to Fort Erie, Ont., the International Railway, Buffalo, N. Y., played the rôle of host to a large part of royalty and American statesmen on a trolley tour through the lower Niagara Gorge.

It was the first time that an heir to the British throne and a Vice-President of the United States, together with more than a score of other prominent members of the royal family and distinguished American officials, were guests of an electric traction company. They deserted their private automobiles and the royal train, which car-

ried the British and Canadian party across the Dominion, for seven especially decorated street cars.

For two weeks previous, the International Railway had been planning every detail of the trip which started at Chippawa, Ont., and continued over the Park and River division of the company to Queenston, over the company's lower bridge to Lewiston through the lower Niagara Gorge via the Niagara Gorge Railway, up through the business section of Niagara Falls, N. Y., over the Falls View Bridge of the railway company and back again into Canada.

The photographs show interior views of two of the cars used by the royal party. The cars previously had been put through the paint shops, the seats had been removed and heavy wicker arm chairs and period furniture was installed. Oriental rugs covered the floors and



The Ondiara, private car of the International Railway, carried the Prince of Wales and his party



The Rapids, private car of the Great Gorge Route, also was used to carry the royal visitors

the cars were decorated with flowers. Arrangements had been made with a caterer to serve tea to the distinguished passengers. The trainmen were especially selected from the viewpoint of experience and appearance. Seven cars were in the procession, the first being a pilot car carrying Bernard J. Yungbluth, president of the International Railway, and other officials. The second car carried the Prince of Wales, Prince George, Prime Minister Baldwin, Secretary Kellogg, Vice-President Dawes and some of the ladies in the party.

All arrangements covering a period of two weeks were handled personally by President Yungbluth. No other traffic was allowed over the various divisions and bridges while the royal party was in transit, and there were no stops for customs or immigration inspection. At the intersection of the International local lines in Niagara Falls and the New York Central Railroad, trains were held up so cars would not be detained at the crossing.

Twenty officials and employees of the company were assigned by President Yungbluth to supervise the trip, indicating the extreme care exercised to insure the safety and comfort of the distinguished party. In addition, other men were assigned to ride the cars in the royal procession and to inspect all men in uniform. The two private cars used were the Ondiara of the International Railway, and the Rapids of the Niagara Gorge Railway. The police supervision was also arranged by the Dominion authorities, the United States Secret Service, the New York State constabulary and the Niagara Falls police, these bodies co-operated with the railway executives and there was a lengthy detailed assignment of these men to prevent any unpleasant incident. One of the photos shows Vice-President Dawes and the Prince of Wales leaving their private automobile at Chippawa to board the International Railway special car.

First Station Completed on Dorchester Rapid Transit

SIMPLICITY is the keynote in the design of the new Columbia station, the first to be completed on the Boston Elevated Railway's new Dorchester rapid transit extension. This station will serve a heavy residential district and several large industrial plants. In general arrangement it is of the "island" type. The headhouse is provided with wide doorways. It has an area of approximately 290 sq.ft. on the sidewalk level for prepayment use. The fare collection apparatus includes two General Electric automatic dime-in-the-slot passimeters and an old type passimeter located at the change booth window.

Two flights of stairs lead from the fare collection barrier to the north end of the platform, which extends 350 ft. beyond the stairs. The width of the platform varies, being 20 ft. wide at the stairs and 23 ft. at the opposite end. A feature of the design is a 4-ft. space between the platform edge and the concrete base, which not only provides a place for cables, wires, piping and other necessary equipment but serves as a refuge for track workmen when a train is approaching. A canopy with slab waterproofed concrete roof is supported by steel members and extends the entire length of the platform. Two switch rooms and toilets for the public and employees are located under the stairways, while a waiting room and station master's room are in the center of the station.

The entire structure is fireproof, being built of brick, concrete and steel. The tracks were so located as to provide for a 135-ft. extension to the platform to be built when increased traffic warrants six-car trains.



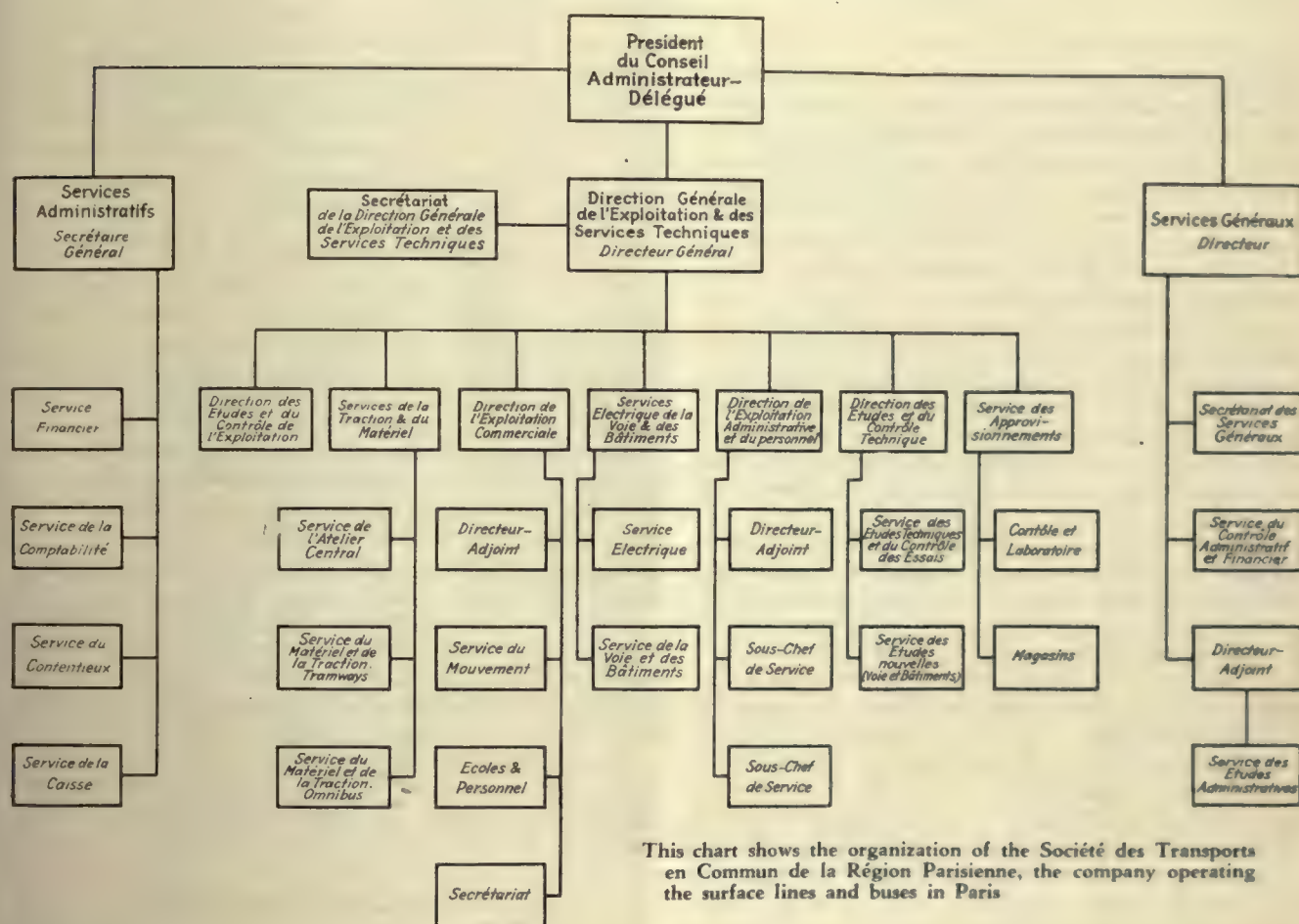
Above, Columbia station from Old Colony Railroad. Columbia Road viaduct and headhouse are on the right

At right, view of the island type station from the viaduct



How the Duties Are Assigned Abroad

European companies have different departments and divisions than railways here. The organization chart of the Paris electric railways and bus system is analyzed



This chart shows the organization of the Société des Transports en Commun de la Région Parisienne, the company operating the surface lines and buses in Paris

ORGANIZATION of the European tramway companies differs widely from that of electric railway companies in the United States. There are more departments, and the responsibilities of the different department heads show quite a variation from American practice. To illustrate this an outstanding European company, the Société des Transports en Commun de la Région Parisienne, which operates all of the tramways and bus lines in Paris, has been selected, and an organization chart is published herewith. In this chart the titles of all of the officers and departments are given in French, as there are no exact equivalents in English for some of the titles.

This company is one of the largest in Europe, and during the ten months ended Oct. 31, 1926, it carried 858,813,055 passengers and had gross receipts of 441,-416,709 francs (\$17,656,668). Besides its buses and

street cars, it operates a short suburban steam road and a line of boats on the River Seine.

The chief executive officer of the company is called *Président du Conseil, Administrateur Délégué*, corresponding to our president.

The three department heads reporting to him are the secretary general, in charge of the department of *Services Administratifs*; the general manager, in charge of the department of *Exploitation et Services Techniques*, and the manager of the department of *Services Généraux*.

The department of "Services Administratifs," presided over by the secretary general, is much greater in scope than that under the same officer in this country. Broadly speaking, it looks out for the corporate life and activities of the company, except that directly connected with the movement of passengers and the legal activities. Besides being responsible for the corporate records and the

preparation of the various financial reports of this company, the secretary general is the ranking financial officer of the company. This means he is in charge of all receipts from the time they are turned in at the various depots by the representatives of the transportation department. He also has charge of all purchases of material and all disbursements, such as payments for wages, pensions and insurance, and even the issue of tickets to the depots. He also attends to the sale of any property of the company and has charge of all litigation relating to claims. The officers of the company corresponding to the treasurer, stock registrar and claim agent report to him. The titles of the four subdivisions of the department of "Services Administratifs" may be translated as finances, accounts, claims and treasury.

TRANSPORTATION AND ENGINEERING DEPARTMENT

All operating questions come under the Directeur Général, or general manager, the title of whose department might be translated as Transportation and Engineering. This department has seven subdivisions, as shown in the chart. The secretary of this department acts as liaison officer to these several subdivisions as well as attending to the duties naturally pertaining to his work. The duties of these subdivisions will be considered as they appear on the chart.

The first subdivision on the chart is Direction des Etudes et du Contrôle de l'Exploitation, which might be considered the same as our schedule department, except that there have been added to it some of the duties of a commercial research department, such as the determination of new routes, compilation of bonuses for motormen and energy-saving campaigns, and of statistics on operation.

The next subdivision, "Services de la Traction et du Matériel" corresponds to our equipment department. This department is shown in the chart to have three divisions which correspond to our (1) main repair shop (2) maintenance of cars, and (3) maintenance of buses. There are also two other departments not listed, i.e., "boats" and "steam railroad," because of the operation of these two services by the Paris company, as explained.

The next subdivision listed is that of "Exploitation Commerciale," which may be termed the transportation department, and its three divisions might be called vehicle movement, instruction and personnel, and secretarial. The first of these has charge of the movement of cars and buses in regular and extra trips, the issue of all tickets to employees and the supervision of carhouses and garages as far as relates to car movement. The second division is responsible for the training of motormen and conductors, the issue of the employees' rule book, application of discipline, safety work, study of the causes of accidents, and the issue of merchandising literature, such as posters and guides. The secretarial department has charge of the employee files and the lost and found departments, and acts as liaison officer for the other group departments.

The next subdivision might be known as the electrical and way engineering department. One of its divisions has charge of the electrical distribution, high tension and low tension, and substations. The other has charge of track and buildings, including cleaning of track and conduit and the greasing of switches and curves.

The next sub-department listed is that of "Exploitation, Administrative et du Personnel." This means a combination of the duties of an American employment department and welfare department. This department attends

to the hiring of the transportation employees, the maintenance of the files of employees who have retired from the service, supervision of the benevolent funds and pensions, and the employees' medical service.

The next subdivision listed is that of "Etudes et du Contrôle Technique" and might be considered as the technical research or statistical department. Its work differs from that of the operating research department already mentioned because its attention is devoted purely to studies for the improvement of the equipment, including track and buildings. It has two subdivisions, one to cover existing equipment, the other, new work, including track.

The final subdivision of the operating department is that of "Approvisionnement," which corresponds to the stores department on an electric railway, except that it also has charge of the printed unissued tickets as well as of all fuel supplies. It also passes on all requisitions for purchases of material and orders for sales, conducts all laboratory tests required on material purchased or under consideration, and performs some other duties which are not usually undertaken by the stores department of an American electric railway.

DEPARTMENT OF GENERAL SERVICES

The final main department is that of "Services Généraux" or general services. This is essentially the legal department, though not including accident litigation. It has supervision of the franchise matters of the company and cares for all legal questions in relation to the franchise which may arise with the municipal authorities. It also has charge of the publicity of the company except that of merchandising literature, but including the relations of the company with the press. All of these duties are performed by the first sub-department, listed in the chart, "Secrétariat," or by the third, "Services des Etudes Administratives."

The second sub-department, or "Service du Contrôle Administratif et Financier," is essentially an auditing department, not only of accounts and inventories, but of all official orders and instructions issued so far as to see that they do not exceed the powers of the company or conflict with existing city ordinances. Where any such orders require the visé of some municipal officer, this department conducts the negotiations to obtain such approval.

Blotters Advertise Levis



These blotters effectively call attention to the beauties of Quebec's South Shore, which is served by the Levis Tramways

QUEBEC'S South Shore and its attractions are being advertised by the Levis Tramways through the distribution of blotters lithographed in color. Attention is called to the superb spots for summer residence and good beaches for bathing and canoeing only a short distance from Quebec that may be reached by tramway or by auto.

Quality Trainmen

Obtained for the Transportation Department

Los Angeles finds careful selection of trainmen greatly reduces labor turnover. About 50 new men only now required to keep force to standard size. Full particulars given of methods employed

METHODS of selecting, employing and training platform men for service on the Los Angeles Railway follow well-established lines. Careful attention, however, is paid to obtain courteous, safe operators who will create public good will. Because of favorable climatic conditions in southern California this company has large numbers of applicants for positions as motormen and conductors from which to make selections. Professional men, operators of experience and other classes of men from all over the country seek positions as platform men in Los Angeles. This abundance of applicants from which to choose has raised the standard of employment and improved the service.

Selecting the proper men centers around a few simple mental tests. No attempt is made to put a man through an extended psychological examination. His ability to react favorably to the Haggerty test, which is a modification of the army examination, is sufficient to qualify him to fill out an application blank. Failure, of course, eliminates the applicant.

The superintendent of employment gives each man a general interview outlining the work and policy of the company, after which an acceptable candidate fills out an introductory blank and is then subjected to the mental test. Tests are given Monday, Wednesday and Friday. Classes of from 20 to 25 applicants are handled, depending on the need for men at the various divisions. Results of the psychology test are recorded and forwarded through the employment department and further examination of the applicant rests upon the grade made.

The successful candidate proceeds to the employment desk, where he is given an arithmetic test which embodies simple problems of addition, subtraction and calculation. This has had its effect in weeding out applicants who are not mentally fit to make out the trip sheets and other forms of the company requiring simple calculating and arithmetic.

MORE THAN 90 PER CENT OF TRIP SHEETS CORRECT

Both systems of tests are employed at the present time, the company not having decided which type will be adopted as final. However, since the installation of the calculation test, combined with the effect of the merit and bonus system, an improvement has been noticed in the calculations made on the trip sheets. Before the tests were in effect, and prior to the merit and bonus system, fully 60 per cent of the trip sheets were calculated inaccurately. Now more than 90 per

cent are correct, as checked by the auditing department. In the calculation test a man is allowed twenty minutes to do the problems. Usually he takes less time than this. His grade in this test is recorded as a percentage, with the notation of the number of minutes he required to complete the work.

With the calculation test passed, the man desiring employment is permitted to fill out the application blank. On this form, shown in an accompanying illustration, the applicant must answer all questions to the best of his knowledge. On the third page of the form is an agreement between the Los Angeles Railway Corporation and the employee. A clause in this agreement says that a \$1 deposit is required of each applicant for payment into the fund of the Co-operative Association of Los Angeles Railway Employees. This fund is for the purpose of covering the responsibility of all equipment furnished by the company to its employees, for uniforms purchased on installments and partially to indemnify the company against losses from wrongful acts of employees.

After the application blank has been filled out and checked by the clerk in charge, to see that all questions have been answered, a receipt for it is given to the applicant.

A man must be 23 years of age to qualify as conductor and 25 years of age for motorman, and he must be under 40 years of age. An exception is made to this latter qualification in the case of re-employment of men with particular qualities which make them especially desirable employees.

Applications of approximately 100 motormen and 100 conductors are kept on hand. Calls are made on these in the order of their application. The experience of the company in calling applicants for service has been that out of the 100 applications on file about 60 men are available for immediate service.

During the past four years the number of new men employed each year has been steadily decreasing. In 1923 approximately 1,600 men were engaged for employment in the train service. In 1925 this number had been reduced to about 800, and at present the employment department is handling only about 50 men per month.

Every Tuesday groups of men, as needed by the operating department, are called into the employment office to report for instruction, and, if satisfactory, for subsequent employment. At this time the men are required to pay an additional \$1.85 for their caps. They are sent from the employment office to the auditor's office to

Form 517 O-1M-4-76-6094 Sta.
Harris Ledger 24 Sub.

RECORD No.

Los Angeles Railway Corporation

APPLICATION FOR EMPLOYMENT

Applicant must read application very carefully before answering questions.

Answer all questions in full.

All answers must be written in ink and in applicant's own handwriting.

Failure to give details prevents proper consideration of application.

A FALSE STATEMENT OR AN OMISSION OF YOUR PAST RECORD IS SUFFICIENT GROUND FOR DISAPPROVAL OF YOUR APPLICATION, IF THERE IS ANYTHING IN THIS FORM THAT YOU DO NOT UNDERSTAND, INFORMATION WILL BE CHEERFULLY GIVEN.

Date.....19.....

To Los Angeles Railway Corporation:

I hereby make application for a position as.....with Los Angeles Railway Corporation, pledging myself, if accepted, to perform my duties in an honest, conscientious and loyal manner, and cheerfully to comply with all the rules and regulations now existing or hereafter prescribed by the Corporation. I agree to have the required number of photographs taken, which will become the property of the Corporation and a part of this application. I further agree to submit to a physical examination by the Corporation's authorized Surgeon.

1. Applicant's name in full (use no initials)
2. Where born? City or town of State or Kingdom of
3. If not a citizen of United States, have you your first papers?
4. Date of birth 5. Mar.
6. Height Ft. In. 7. Weight
10. Complexion 11.
12. Have you now or have you ever

Consumption or tuberculosis of

Form 517 O-1M-4-76-6094 Sta.
Harris Ledger 24 Sub.

LOS ANGELES RAILWAY CORP. REQUEST FOR EXAMINATION

Name		Department	Applicant for Position as	At
Actual Employee as		Dr. E. A. Bryant Chief Surgeon		
Dr. Henry Peige		Assistant Surgeons		
Dr. Chas. A. Fisher		Dr. Carlton S. Allen		
Dr. D. G. Andian		Dr. Gerald F. Smith		
To Medical Department, 520 L. A. Ry. Bldg., 11th & Bdwy. Office Hours 8 A.M. to 5 P.M. and 7 to 8 P.M. Sundays 10 to 12 A.M. only This will be presented to you by the above named party. I have noted thereon the necessary information as to his employment. Will you please examine him in the manner specified in the Company's instructions, sending regular Certificate of such examination.				
Signature of party to be examined		Nativity	Supt. of Employment.	
Date of birth	Weight	Complexion	Color of Hair	
Height	Color of Eyes	(OVER)		
Note:—Descriptive part should be filled out by party issuing permit and signature written in his presence.				
20. Father's name..... { Living } { Deceased } Mother's given name..... { Living } { Deceased }				
21. Residence of parents.....				
22. How many persons are totally dependent on you for support?				
23. How many persons are partially dependent on you for support?				
24. Give name and address of person or persons you desire to have notified in case you become seriously ill or injured.....				

- No. 1. The application blank, which is a four-page folio, requests detailed information. The third page contains a working agreement between the corporation and the employees
- No. 2. The medical department fills out this form at time of examination

make this deposit and from the auditor's office to the tailor shop, where the cap is issued. A medical examination is given at the time the application is made, so that there will be no delay in placing the man in the school of instruction if he is satisfactory in other ways. Also, at the time of medical examination, the applicant is told about the medical service which is given on a co-operative plan by the company. Trainmen who pay a fee of 50 cents per month are entitled to medical attention, advice and treatment. The company pays an additional 50 cents per month for each man in order to maintain this service.

The order in which the applicants return from the auditor after depositing the money for their caps determines their seniority for the term of employment with the company. After all have reported back to the employment office they are given their first course of instruction.

INSTRUCTION BY CLASS AND ROAD WORK

Classes for instruction are held two days a week at twelve noon. The superintendent of instruction outlines the prospective work for the men, stressing the disagreeable features as much as possible. After his preliminary lecture and at several times during the course of instruction he gives those who do not care to go on with the work an opportunity to leave. About 12 per cent of the men leave for one of four causes: Resignation, falsifying of application, general slowness and insubordination.

At the preliminary instruction the men are told that if they qualify and are employed they will receive \$2 a day for the instruction period. After that they will receive the regular wage scale with a guarantee. The course of instruction varies with the man. For some it requires only two days; with others fourteen, being shorter for conductors than for motormen. After the first day of class instruction the men are divided into groups, the student conductors being taken by the conductor instructor and informed of their duties.

The motorman instructor takes the class of student motormen to the instruction car, where the main instruction is given. Two cars are used

for this work. Both are of a rather old type, but one which naturally would be used by a new trainman on a tripper run. Four days are spent by the class of motormen on the instruction cars. The first day is spent with the car in the yard. On the second day the motorman instructor runs the car out of the yard and over one of the lines of the division, showing the new men the operation of the controller and air brake and calling their attention to conditions along the line.

In the yard work the student is taught to keep his head up while at the controller. Each man is given a chance, the instructor permitting him to try to master

Form 547-O—2500—6244 Sta.
Optimo Bond—17x22—16

Los Angeles Railway Corporation

Los Angeles, California, _____, 19____

Mr. _____

Dear Sir:

Mr. _____ of _____

has applied to this Company for a position as _____ and refers to you for testimony as to his character. If appointed to this position, human life may depend upon his judgment or be imperiled by his carelessness. He will, if appointed a conductor, have custody of the money of his employer, and will besides come in daily contact with the aged and feeble and with women and children, who are entitled to the utmost courtesy and the highest degree of care. Is the applicant, in your judgment, fit to occupy the above position? This Company feels seriously the responsibility of making such selections; there is too much at stake to accept applicants without the most careful inquiry, and therefore it adopts this means to assist it in securing the best men available.

Will you kindly give me, as early as possible, the information asked for in the following questions? Your answers will, I assure you, be considered entirely confidential and without prejudice to you.

Yours truly,

Superintendent of Employment.

How long have you known the applicant? _____

When did your acquaintance with applicant cease? _____

If in your employ, how long? From _____ to _____

Why did he leave your service? _____

Are you related to him, and in what manner? _____

Are his habits good? _____

Is he _____

Has _____

What _____

What _____

What _____

Has he _____

If so, in _____

Has he _____

What Capacity _____

Where _____

Remarks _____

Union or _____

Is attached _____

Dated _____

PLEASE

IS B

3

LOS ANGELES RAILWAY CORP.

Office of Superintendent of Employment

Married-Single
Widower-Divorced

Age _____

Phone No. _____

Assigned to Division No. _____

LOS ANGELES RAILWAY EMPLOYMENT DEPARTMENT

Los Angeles, Calif. _____

The bearer, _____ 192____

appointed _____ has this day been

accordance with this Company's instructions, giving him a receipt. You will also require him to sign his name in space below.

5

Sign Name Here

Superintendent of Employment

Supt. of Employment

4

the sequence of operations before permitting another to practice. Imaginary starts and stops are made, the instructor giving the bells while a student operates the handles. With a car out on the line the instructor permits first one student and then another to run it, making starts and stops to pick up imaginary passengers. This preliminary instruction work lasts four days. In addition, for two nights the students must operate the car under the guidance of an instructor during the evening hours. If on the fourth day the student is

No. 3. Requests for information on applicant are made on this form. A photograph of the man is placed in the upper right hand corner

No. 4. After a preliminary examination by the superintendent of employment, this form is filled out to serve as an introduction to the testing department

No. 5. Order on photographer to have applicant's picture taken. A copy of the photograph is sent with each reference inquiry

not bewildered by the downtown traffic, nor has become confused in an emergency, he is considered qualified for further instruction on a regular run with a line instructor.

Final training of the student is handled individually by line instructors who operate out of the various car-

houses. They are men picked particularly for their ability, and for this work they are paid \$1 per day extra. Runs on which line instructors teach motormen are particularly long and cover the greatest amount of territory. About seven such runs are taken out of each division, this amounting to approximately 20 per cent of the number. The student reports to the line instructor and stays with him until the work is completed, taking a different run each day, so that at the end of eight days the division has been covered by the instructor and student. As there is not enough training to go around, the work is rotated so that all instructors are assigned to part of it.

Vacancies in the operating department supervisory positions are filled from the group of line instructors. This system is designed to anticipate the future approximately five years, when openings will occur in the operating department which of necessity must be filled from the rank and file of the organization. Since this system was begun two years ago seventeen men have been promoted to supervisory positions. At the time a line instructor qualifies for such a position he is asked what particular work in the department appeals to him and what position he would accept. This statement is placed on his qualifying papers and when an opening occurs he is asked if he cares for the position.

Conductors are instructed for about eleven days by an operating conductor instructor. They are taught how to make out trip sheets and the various forms required. This work is supplemented by outside instruction on the car under the supervision of a line instructor similar to that done in the case of the motormen.

ON PROBATION FOR THREE MONTHS

While under the line instructors on the cars both conductors and motormen are subject to additional quizzing by other line instructors. Those who show aptitude are pushed through the course more rapidly. After qualifying with the line instructor, the student is turned in to the division headquarters as ready for work. His name is placed at the foot of the extra list, and from then on he becomes a regular employee of the company. For 90 days from starting the instruction work the new man is on probation. Three months after the probation period is up he comes under the merit and bonus system and is entitled to receive \$5 per month bonus for efficient operation.

While on probation the new man is given additional training by traveling instructors, two of whom operate out of each division. These men call attention to infraction of rules or improper handling of equipment.

As a rule they do not report such lack of efficiency to the operating department, but make the correction on the spot and stay with the student until he has overcome the difficulty. However, instructors do make reports of inefficient operation of regular trainmen. These reports have their effect on the trainman's efficiency record, upon which is based the bonus system.

Particular attention is paid to instruction in energy saving. A watt-hour meter is carried on each car, its use is explained to the new man and he is taught how he can best operate the car to reduce the energy consumed.

After 90 days of service the new trainman returns to the instruction department for four hours of lecture work. These groups are made up of practically the same men who formed the student instruction class.

No attempt is made in the course and during the subsequent car work under the line instruction to teach the student the details of equipment and how it operates. The principle has been to give the men one thing to assimilate at a time and gradually to work up to the more complicated details of motor control and train operation. At the South Park shop is located an instruction room fitted with both the K and H-L types of control and a complete layout of air lines. Groups of motormen on probation are given instruction on this apparatus so that they will be familiar with the mechanical operation of their equipment. It is not the intention to make mechanics out of them, but each man must be able to make minor adjustments on the road in order to cut delays to a minimum.

INSTRUCTION IS CONTINUED TO TRAINMEN

After a man is definitely started in the regular train service his instruction does not stop. Meetings are held every other month, at which a representative of the supervisory force, the superintendent of operation, his assistant, or some other company executive, addresses the men at the various divisions on the matter of safety, courtesy and efficient service.

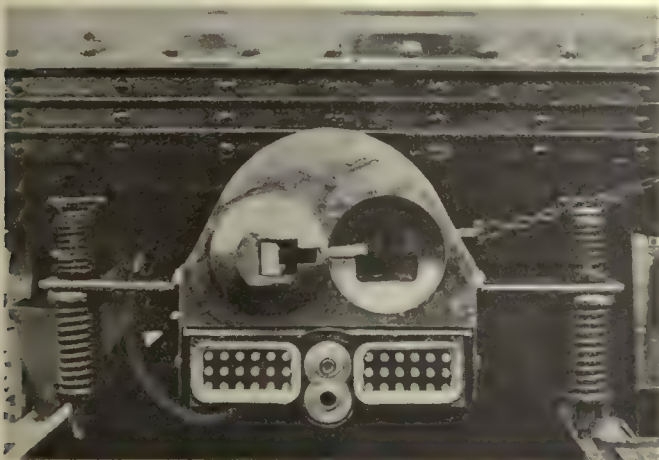
Three talks are given on each particular day to each division. This permits the attendance of men who work at various hours. On alternate months questionnaires are sent to the men, with the request to return the answers to the division superintendent within a specified time limit. All of these questions relate to operating problems and the answers should be known to each trainman. At the lecture these questions are gone over in a general way and additional information given to the men on any point which, through their answers to the questionnaires, they have indicated lack of knowledge.

Gray Line Shows Missourians

WHILE Kansas City keeps growing in numbers and in industries, opportunity is not lacking to interested residents and inquiring visitors for acquaintance with that section of the country bounded by the fertile valleys of Missouri and the wheat fields of Kansas. Seeing Kansas City via the Gray Line is an education no less inspiring than instructive. So thorough has been the survey for sightseeing possibilities that now no fewer than seven tours are being conducted by the Gray Line, operated by the Kansas City Public Service Company in Greater Kansas City. Considering this is the initial attempt of the company into the sightseeing business, the tours are doing remarkably well. Many interesting trips can be made by street car or motor coach, the routes of which traverse every section of both Kansas City, Mo., and Kansas City, Kan., extending as far east as Independence, Mo. The Montgomery Ward and Sears-Roebuck plants, the famous Country Club residential section, well-known boulevards and parks and the industrial districts are all reached by one or more of the tours.

These places of interest are described very alluringly in a twelve-page illustrated pamphlet containing map and all necessary details as to price, time consumed on each trip, length of tour and historic points of interest covered en route. In addition suggestions are made to prospective picnic parties for the chartering of coaches, to parties desiring to spend a day on the golf course and to travelers seeking a sightseeing itinerary in other cities.

Hamburg Elevated Develops Automatic Combination Coupler



At left, front view of coupling; at right, side view of coupling

COMBINATION of the functions of a car coupler and methods of connecting the air pipes and electrical conductors has been accomplished in an automatic coupler by the Hamburg Elevated Railway, Hamburg, Germany. A number of the cars have been equipped with this coupler, and its use is being extended to the rest of the equipment. The car coupler is above and the electrical and air couplers below, and the latter are protected by a cover which automatically swings upward and back when the coupling takes place. The operation of the car coupler is well shown in the five line engravings.

Fig. 1 is a plan view of adjoining couplers on two cars about to be coupled. In each end there is a link attached within the housing to one side of a sort of triangular plate, pivoted in the center and held by a spring in the position shown. On the side of this plate opposite to the link is a notch over which the link on the other coupler slips.

Fig. 2 shows the action of these plates as the cars come together, the triangular plates turning, so that each link slips into its proper notch. When the faces of the couplers are together the springs draw the plates to the position shown in Fig. 3.

Uncoupling is accomplished by a chain which, when pulled, throws the plates into the position shown in Fig. 4, releasing both links. The triangular plates then return to their original position, the first to do so being the one whose chain has not been pulled, shown as the one at the left. Its link then slides further into the housing of the other car, and remains in the position shown in



Coupling with protective cover down

Fig. 5, until the cars part. Then the second plate returns to its original position.

The principal feature of the electrical and air portions of the coupler is the sliding cover shown in the third halftone engraving below the car coupling portion of the coupler. This cover, which is pivoted, revolves up and back through the action of the triangular plate, already mentioned, when coupling is to take place.

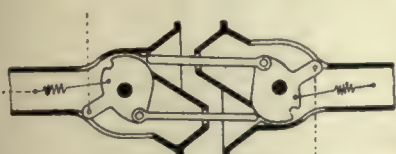


Fig. 1

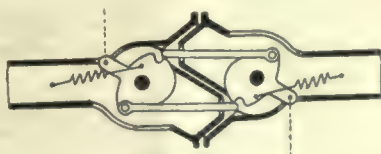


Fig. 2



Fig. 3



Fig. 4

Automatic car coupling operates by double link

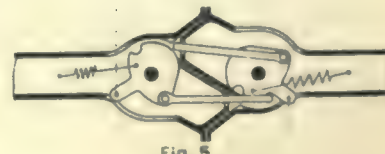


Fig. 5

Valves keep the pressure air pipe closed except when the cars become coupled, and a special electrical switch near the controller in the motorman's cab provides the necessary connections for cutting out any disabled car, making the circuits dead at the time of coupling or any other connections desired.

The car coupling portion of the coupler described is known in Germany as the Scharfenberg type. The electrical and air connection portion of the coupler was developed by the engineers of the Hamburg Elevated Railway.

Calculating Rail Tonnages by a Lightning Method

By EDWARD A. ROBERTS

Of Fisk & Roberts, Consulting Engineers, New York

MOST of us have gazed in amazement at so-called lightning calculations as the demonstrator deftly solved an intricate problem of arithmetic by some apparently absurd twist of his numbers. Later study always showed that a definite law of mathematics, and not magic, supported the lightning calculation.

Such a method of calculating the number of gross tons of steel in any given length of railroad has been developed by this organization to simplify the hundreds of calculations that are necessary in making an appraisal of a railway property. For example, consider this problem:

How many gross tons of steel (2,240 lb. to the ton) are there in a stretch of 33.11 miles of single-track railroad built of rail of 70-lb. section (70 lb. to the yard)?

Now to figure that without a handbook means, first, to convert the miles into yards, multiply by 70 to get pounds and divide by 2,240 to get gross tons. Then the answer is wrong because you forgot to multiply by two on account of single track consisting of two rails. The lightning method of getting the correct answer is this:

Write down the number of single track miles.....	33.11
Write it down again, one space to either the right or the left	33.11
Add the two, setting the decimal point one place further right	3,642.1

The exact number of gross tons of steel in the section of 33.11 miles of single track constructed of 70-lb. rail is 3,642.1. This method is infallible and gives the correct weight to the last ounce.

It is unnecessary to remember whether the second entry of the number of miles is set to the right or the left of the first number. The answer is the same, of course, whichever way the second number is set down. For example:

33.11	33.11
33.11	33.11
3642.1	3642.1

This method of calculating the weight of 70-lb. rail will give the correct answer for any length of rail under the sun. No magic has been used in selecting the particular mileage used in the illustration.

The above method, to be sure, does apply only to calculations involving 70-lb. rail. It can be adapted readily, however, to many other standard rail sections with a simple modification, particularly to 56, 60, 80, 84, 90 and 105-lb. sections. This modification consists of

adding to or subtracting from the result obtained above the proportion represented by the difference in weight between 70-lb. rail and the desired rail section. A 105-lb. section is 50 per cent heavier than a 70-lb. section, and the complete calculation becomes:

	33.11 miles of single track
	33.11
Divide by 2	3642.1 gross tons of 70-lb. rail
Add	1821.05
Total	5463.15 gross tons of 105-lb. rail

Just one more typical application to a different weight of rail, in this case 80 lb. to the yard:

	33.11 miles of single track
	33.11
Divide by 7	3642.1 gross tons of 70-lb. rail
Add	520.3
Total	4162.4 gross tons of 80-lb. rail

The reason for dividing by 7 is that 80-lb. rail is one-seventh heavier than 70-lb. rail.

This method of calculating rail tonnages is particularly applicable to field work and to calculations made without the assistance of handbooks and prepared tables of weights. On account of its simplicity it can readily be remembered.

The underlying principle is so extremely simple that it will not be stated here. Those who are interested enough to test the application of the method will enjoy discovering why it is absolutely infallible.

Careful Organization Makes Big Bus Excursion Successful

MORE than 1,200 passengers, members of a large benevolent association, were carried on July 28 on a 108-mile excursion without a single mishap by 56 buses of the Public Service Transportation Company, a subsidiary of the Public Service Corporation of New Jersey. The buses started from Newark at 8 o'clock in the morning and followed a route through Elizabeth, Rahway, Perth Amboy, South Amboy and Red Bank to Asbury Park. Each driver was supplied with a type-written description of the route to be followed. The first bus arrived at its destination at 11:15. A five-minute stop was made at Morgan, about half-way, where the buses pulled in at a prearranged parking space alongside the road. Returning, the buses left Asbury Park at intervals between 6 and 8 p.m., and the last bus reached Newark about 11 p.m.

All buses were 31-passenger gas-electrics. They were operated in groups of five, each group being designated by a letter and each bus by a number. These designations were placed on placards outside the vehicle for purposes of identification. A supervisor was assigned to each group of buses, riding on the last one of the group. The headway between groups was five minutes. How well this was maintained is indicated by the accompanying reproduction of a headway check taken along the route.

An extra bus was assigned to every third group. This carried no passengers, but was driven by a mechanic. At the rear of the entire procession was a service truck. The only trouble which developed during the entire excursion



sion was a flat tire. Passengers on the bus which developed the flat tire transferred to the next empty bus which came along. The mechanic then replaced the tire with a spare and soon caught up to the procession again.

Parking was arranged for several days in advance. Two men had been sent down an hour beforehand to complete the necessary arrangements.

Buses were stored in a large lot on Ocean Avenue. This was measured off by the advance agent and markers placed denoting the position to be occupied by each group of buses. Two car cleaners accompanied the excursion and cleaned out the buses while the passengers were amusing themselves at Asbury Park.

Long Island Cars 100% Steel

ONLY cars of steel construction will be operated for the transportation of passengers on and after Saturday, September 10, according to an announcement made by the Long Island Railroad management.

Early this year the board of directors authorized the purchase of a sufficient number of steel passenger cars to replace every remaining wooden passenger car by the end of 1927. The rapid delivery of these new steel cars makes it possible to remove all the wooden cars in service, sooner than was anticipated by the company.

With the acquisition of nearly 250 steel passenger cars during 1927, at a cost of approximately \$5,000,000, and the retirement of 135 remaining wooden cars, the Long Island takes rank as the first Class I railroad in the United States to place its passenger carrying equipment on a 100 per cent steel basis.

Above — Start of the excursion from Washington Park, Newark

At left—The headway check shows close adherence to schedule on big bus excursion

Below — Some of the 56 buses parked in a vacant lot near the beach

H 423-437-12-26.

PASSENGER COUNT (RIME)

TAKEN AT CHESTNUT ST & ST GEORGE AVE.
7408
JULY 28 1927 EXCURSION BUSES LINE

TO				BOUND				ASBURY PARK BOUND			
BUS	TRAIN	TIME	PASSE.	BEATS	BUS	TRAIN	TIME	PASSE.	BEATS	BUS	TRAIN
5506	"	9.00	Full	30	5507	"	9.00	Full		5508	"
5509	"	"	"	"	5510	"	"	"	"	5511	"
5512	"	"	"	"	5513	"	"	"	"	5514	"
5515	"	"	"	"	5516	"	"	"	"	5517	"
5518	"	"	"	"	5519	"	"	"	"	5520	"
5521	"	"	"	"	5522	"	"	"	"	5523	"
5524	"	"	"	"	5525	"	"	"	"	5526	"
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The Readers' Forum

Traffic Control Must Be Fitted to Needs of Particular Situations

CHICAGO SURFACE LINES

CHICAGO, ILL., July 14, 1927.

To the Editor:

It is hardly safe to generalize too much concerning any of the features of signal control of traffic. In general, the short cycle speeds up traffic movement, as stated in the editorial which appeared in *ELECTRIC RAILWAY JOURNAL* July 30, but we must remember at all times that the setting of a signal system to a given section of street is an engineering job wherein the length of cycle, the time given to the cross-streets, the speed of movement, system of signals, the control of turns or the handling of other special features should be made appropriate to that particular section. It is no more appropriate to use stock methods of handling traffic than it is for an architect to draw on stock plans from his cabinet, regardless of the requirements of his client or of the location on which a building is to be built. Approximately correct results can sometimes be achieved by such treatment, but best results are obtained only by careful study.

If signal control is to be used at a single intersection, the traffic at that intersection will be delayed the least if changes come frequently instead of having a long cycle in operation. Traffic arrives at single intersections in a somewhat uniform volume per ten-second intervals. A driver, however, can slow down slightly when approaching an intersection that has a traffic light set against his movement, so as to arrive at that intersection after the light has changed to green. If the cycle is short few vehicles will be standing still waiting for the light to change. When it does change those vehicles standing and those that are moving slowly to approach will cross the intersection quickly, leaving an open space behind them. Then if the light changes promptly for the other direction the next wave of vehicles will form in a similar way and the intersection will be used actively all the time without much wastage and with only short delays to the vehicles.

When the control is a part of a system, it is advantageous to avoid stretching out the group of vehicles that moves through together, and rather to keep them in reasonably compact form so that each portion of the green light may have its proper and uniform quota of vehicles. If either vehicles or pedestrians on the cross street are held too long there is developed unnecessary impatience and needless delay. It is possible to make much more uniform flow of traffic with short cycles than with long ones.

The length of cycle should have a definite relation to the speed and the distance between cross streets, and it is also influenced by the interference that is occasioned by the kind of turns permitted, the volume of pedestrians, the physical handicaps to free movement of vehicles at a given intersection such as street offsets, restricted widths of lanes, improper contour of paving and sharp curb corners. Sometimes the cycle may be either of two lengths which will differ considerably, such as either 60 seconds or 100 seconds. In one instance where these two cycles were tried they gave substantially the same speed, but one gave greater street capacity than the other, be-

cause the longer of the two permitted longer movements at intersections where handicaps to movement prevent a reasonable number of vehicles passing through under the short cycle.

Conflicts at troublesome intersections are sometimes aggravated with too frequent changes. For example, in our recent check of the effect of a 75 second cycle as compared with an 85 second cycle in the heaviest evening rush hour on Wabash Avenue, we found that due to both right turns and left turns for vehicles and almost capacity use of the street, the number of vehicles in one block waiting for the green light in the next intersection ahead could not pass through that intersection on the shorter cycle. With the longer cycle and less frequent changes the vehicles and street cars could pass through the loop with fewer missed lights. On the streets more lightly used, such as Clark Street, the shorter cycle with more frequent changes permits each block to be made in a shorter time, and therefore a greater speed was attained by each street car or vehicle.

It is the desire to avoid an appearance of inertia of traffic and to permit a group or wave of vehicles to pass through a street with the fewest number of stops that has led the users of synchronously controlled systems to adopt longer cycles, and having got the mass in motion, to keep it in motion as long as seemed tolerable for the cross traffic. However, the co-ordinated control breaks this traffic up in smaller groups by frequent changes in signals at the entrance to the system, and then so arranges the signals that these vehicles once started may keep on traveling without the waste that comes from stopping the group and then starting it again.

E. J. McILRAITH,
Staff Engineer.

Kansas City Cars Handle Record Crowd

THE Kansas City Public Service Company handled the largest crowd in its history on Friday night, Aug. 5, at the motion picture party of the Kansas City *Star*. Sixty thousand people attended the first showing in Kansas City of "The Rough Riders," and of this number only about one-tenth could find parking space for their automobiles. The remainder were transported by street cars. Thousands used their cars to approach as near as possible to Muehlebach Field and rode the rest of the way on the street cars.

Early in the evening 75 extra cars were placed on the Brooklyn and crosstown lines leading to the field. Within an hour this had to be increased until the company had 300 extra cars transporting the greatest single-event crowd in Kansas City's history. There were no traffic jams. Motorists were not allowed to park between 18th and 21st Streets, the region of the field.

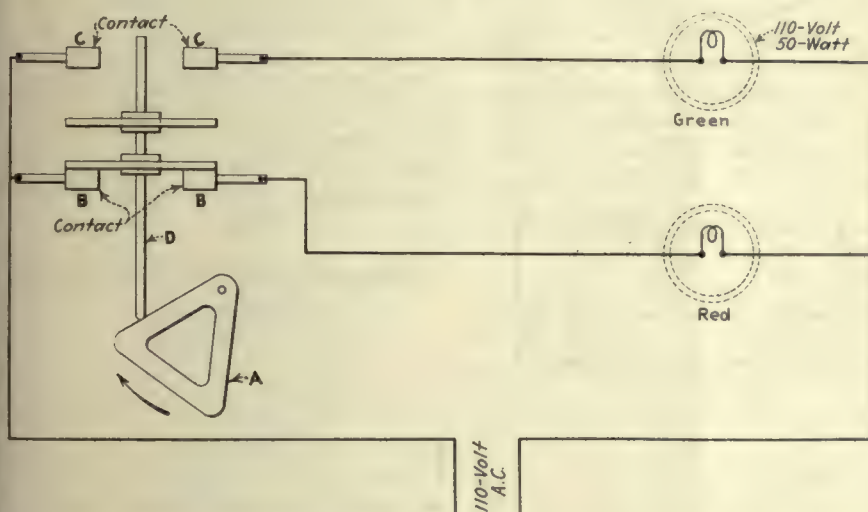
When the performance was over the 60,000 people were removed by the street cars in an hour and ten minutes without trouble. The crowd moved quietly, and outside the field D. L. Fennell, general superintendent of transportation for the Kansas City Public Service Company, had a string of 300 cars, standing fender to tail light from 31st Street to 10th Street. Extra lamps strung around the field by the company flooded the neighborhood after the show ended and enabled the vast crowd to reach the street cars with ease and rapidity. The company had 141 employees on foot between 18th and 31st Streets in directing and expediting traffic.

Maintenance Methods *and* Devices

Signal System Prevents Telfer Derailments

WHERE a number of telfer cranes are operated at a high rate of speed and where switches are constantly being thrown from one rail to another there is a possibility of derailment due to running through an open switch. To minimize this danger the Interborough Rapid Transit Company of New York developed and installed a simple signal system which automatically protects an open switch with a red light and gives the right of way to the closed switch with a green light.

The telfer switches are operated by hand and when opened or closed come in contact with a safety stop which is connected through a movable arm to a set of interlocks controlling the red and green signal lamps. With the safety stop "A" in the position shown in the sketch the red light is in operation, indicating that the switch is open. When the switch is closed stop "A" moves upward as indicated by the arrow, moving the relay arm "D" upward, closing contact "C" and opening contact "B." This puts the green light in operation and extinguishes the red signal.



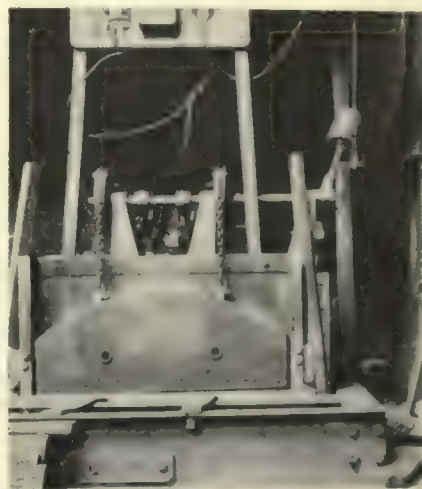
Wiring diagram shows connections to telfer signal lights. Relay-rod "D" is raised or lowered by operation of safety stop "A"



Simple signal system on telfer tracks in Interborough shops prevents derailments

Electrically Controlled Gas Oven for Heat Treatment

ONE of the most convenient parts of the equipment of the shops of the London County Council Tramways, London, England, is an electrically controlled gas oven for heat



This automatically regulated heat treatment furnace has been found very convenient for tires, brake riggings and similar parts

treatment of tires, brake rigging and other parts for which such treatment is suitable. Its advantage is that they can be left in the oven without fear of injury as the temperature cannot rise above the predetermined temperature. The automatic control is obtained by a thermocouple which actuates the regulator admitting gas and air into the furnace. Another feature of the furnace is that when the door is raised the gas is shut off automatically so that there is no burst of flame. These features make the equipment much easier to handle.

Incidentally, it might be said that all steel tires on this tramway system are now being refinished by grinding, rather than being turned on a lathe. This method is found to give a great saving in material over re-turning, the saving amounting each year to about 300 tires.

There is also a saving in time, as one grinder can finish twelve pairs of wheels a day as compared with five or six pairs a day turned on a lathe. Axle fits are also now being ground instead of being turned. An improvement in brake rods recently introduced has been the repair of broken rods by butt welding by

the electric transformer method rather than by forging. Since the introduction of the electric butt welding machine for this and other work for which it is adapted it has been possible for the shops to shut down two smithies with six men.

Wooden Gear Cases Are Used in London

ON ALL of its motor equipment the London County Council Tramways of London, England, is using a wooden gear case made in its own shops, for which a number of advantages are claimed. One advantage is that it is lighter than a steel case. A second advantage is that if injured the case can be repaired more easily. There is finally the thought that a wooden gear case may reduce the noise of the gears, although there is no definite information on this point.

The gear case is made of white-wood, strapped with No. 12 or No. 20 malleable steel straps. The top and bottom parts are of $\frac{1}{4}$ in. plywood, which is steamed and bent to shape before being nailed to the sides. The

nails used are 1 in. with a screw thread. A strap of No. 20 s.w.g. gage malleable steel protects the bottom from injury. All rivets used are of copper with a flat head inside the gear case.

Before being put into service each half of the gear case receives not less than four coats of gray enamel, each being thoroughly dried before the next is applied, to insure that the surfaces, especially of the interior, are finished with a hard, glossy and oil-repelling coating.

The cost of the gear case is about 50 shillings (\$12) each.

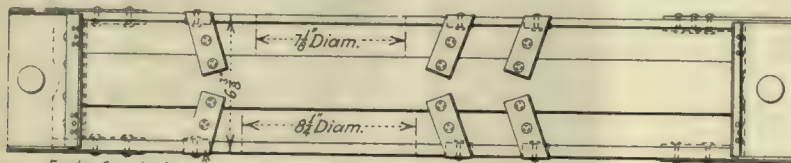
Ladder for Depot Inspection of Cars

MOVABLE ladders or scaffolding for the use of car inspectors are part of the equipment of the carhouses of the Berlin Surface Lines, Berlin, Germany. One of these ladders, shown in the accompanying illustration, is mounted on six wheels and can be pulled from one corner of the carhouse to another very easily by a handle in front. It is also fitted with a brake which is



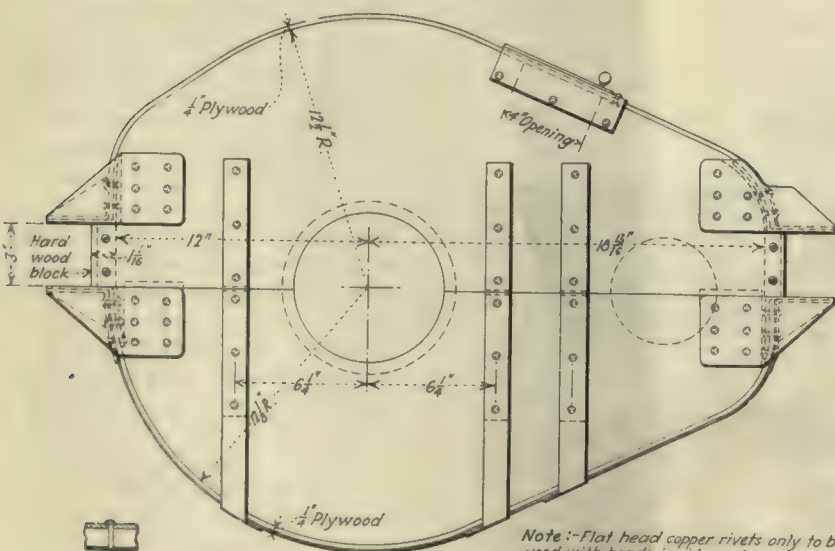
Movable ladder used for car inspection in carhouses of Berlin Surface Lines

set from the upper platform. This upper platform is high enough so that the trolley and other parts on the roof can easily be inspected from it. As the motor resistances in Berlin are carried on the roof instead of underneath the car, roof inspection has to be somewhat more thorough than otherwise. There is another platform on the ladder about half way down.



Ends of protecting strips bent under and riveted to bottom of case

Plan of Bottom Half Case



Bottom Half

Note: Flat head copper rivets only to be used with heads inside as shown



Plan of Top Half

London County Tramways uses wooden gear cases exclusively

Prolonging Life of Steel Ties in Concrete

By LOUIS T. BOTTO

Superintendent Maintenance of Way San Antonio Public Service Company, San Antonio, Tex.

BEFORE placing the concrete in steel tie track construction a final test should be made to make certain that each tie bolt is tight. Each bolt should be given a tap with a light sledge and then the nut should be given its final turning.

Good results in concreting are obtained by using a 1:3:5 mixture. If the sand varies in color or texture it should be tested to insure that it will make good concrete. Sound materials are essential. The amount of water in the concrete should be kept as low as possible to permit proper workability and the concrete should be tamped thoroughly under and around the ties and rails. It is good practice to delegate a man to see that this tamping is performed carefully.

After concreting, traffic should be kept off the new work for at least fifteen days and the concrete should be kept damp during this period. With the observance of these simple precautions, under ordinary conditions steel tie construction should last the entire life of the rail.

Combined Gage and Jig for Brush Holders



A combination jig and gage for Westinghouse type 50L brush-holders is shown in the center. On each side is a brush-holder, one right hand and the other left

THREE carbon brushes per brush-holder are used with the Westinghouse type 50L railway motor. The $\frac{1}{8}$ -in. pin about which the pressure adjusting mechanism pivots passes across the entire width of the brush-holder and through lugs at each of the partitions separating the brushes. It is thus necessary to drill four holes in the brush-holder lugs in order to insert the pin. These holes must be located accurately so as to line up with each other and also so as to be in a plane perpendicular to the brush-holder support.

When these brush-holder holes become worn it is the practice of the Brooklyn - Manhattan Transit Corporation, Brooklyn, N. Y., at its 39th Street repair shops to fill in the holes by welding and then to redrill them. For this work a convenient jig has been constructed in which a pair of brush-holders, one right and one left, can be inserted and drilled with one setting. The jig has a rectangular steel bar just above the base plate over which the casting support fits. The upright portion of the jig is arranged with four arms which project out and fit on either side of the carbon brush separating partitions. In order to place a brush-holder on the jig it is necessary for the carbon boxes to be perpendicular to the section which fits about the support. Any distortion of the brush-holder castings will prevent their being shoved into position and so the jig serves as a gage for making certain that the brush-holders are in proper alignment. With the brush-holders in position they are clamped tightly by two knurled knobs. The entire fixture with the two brush-holders in position is then placed on a

drill press and the holes are drilled in one operation.

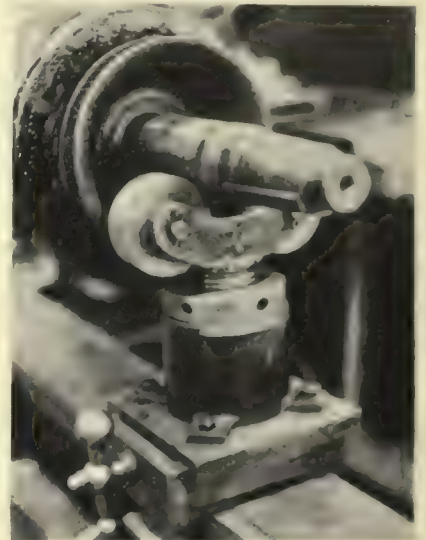
The accompanying illustration shows the jig with two brush-holders, one on either side. The drill is shown in the bushings of the arms so as to indicate just how the holes for the pivot pins are drilled.

Aligning a Commutator for Slotting

TO INSURE accurate slotting of commutators a valuable attachment has been developed and installed on the commutator slotter used in the shops of the Market Street Railway, San Francisco. This consists of a tailstock mounted on the bed of the slotting machine which allows for the transverse movement of the pinion end of the armature so that the travel of the milling cutter

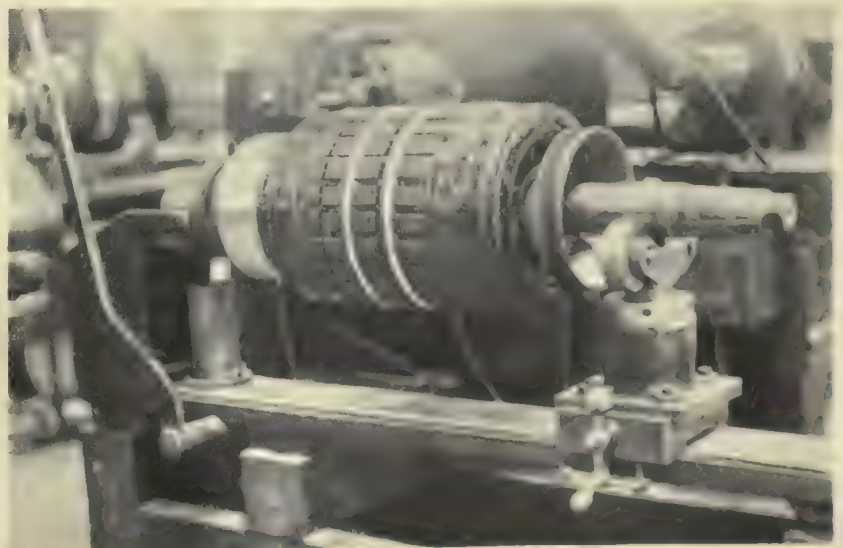
may be made to follow the slot in the commutator. Rarely is the commutator assembled with the slots directly in line with the shaft.

The tailstock allows for this transverse movement of the pinion end of the armature and also for raising and lowering. It slides freely on the bed of the machine. Incorporated in the base is a feed screw which moves the upper part across the baseplate, similar to the cross feed on a lathe. The upper part includes a large diameter elevating screw with supporting nut having holes for a spanner wrench. The head of this screw is Y-shaped with 3-in. rollers mounted on pins near the ends of the frame.



Tailstock allows for both transverse and vertical movement of gear end of armature shaft

The cross feed is similar to that used in a lathe. The elevating screw is similar to those in house jacks. The two rollers in the Y frame are identical with two in the head of the machine



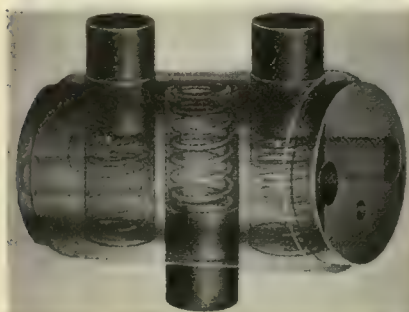
Commutator slotter equipped with tailstock to allow for accurate alignment of commutator segments with the milling cutter

New Equipment Available

Improved Features in Trolley Wheel

AUTOMATIC lubrication by means of graphite plugs is an outstanding feature of an improved trolley wheel being marketed by the Ohio Brass Company, Mansfield, Ohio. Three graphite plugs provide sufficient lubricant for at least 30,000 miles of service. The plugs are compounded especially for this service and provide for lubrication throughout the life of two O-B wheels. They eliminate the use of oil or grease.

The graphite plugs are inserted in the axle and are pressed outwardly



Three graphite lubricating plugs provide lubrication for the trolley wheel

against the wheel bearing surface by means of three coil springs. Two of the plugs press against the bottom of the wheel bearing and one against the top. They are of sufficient size and spaced closely to insure constant lubrication of the entire bearing surface of the wheels.

Unusually large closely fitted bearing areas for the axle and harp are provided. One-half of the axle bearing area is always in close contact with the wheel, while the machined butting areas of the axle are clamped solidly against the equally large contact areas of the harp, which eliminates brush contact washers and springs. The axle is made of hardened cold-rolled steel and is ground accurately to size. Its area is three to four times the usual area of the pins generally used in old-style trolley wheels and harps. The axle is bolted solidly against the two halves of the harp by two bolts which pass through the axle. These bolts can be drawn up as tightly as desired without affecting the operation of the wheel. Thrust washers made of special Bakelized fiber are placed on each end of the axle between the wheel hubs and the harp to

prevent end play of the wheel and contact with the harp. These washers prevent arcing between the wheel and the harp and resist moisture.

The wheel itself is cast of a high-grade bronze alloy developed particularly for electric railway service. The harp is made of Flecto malleable iron, which is claimed to be free from brittleness. It is hot-dip galvanized.

Cold Steam Cleaning Equipment

EQUIPMENT for cold steam cleaning of automotive equipment has been announced by the Cold Steam Corporation, Charlottesville, Va. It includes a boiler with necessary connections and a cold-steam nozzle. The boiler is of the vertical fire tube type, designed for working pressures up to 200 lb. per square inch. It is made in accordance with the American Society of Mechanical Engineers boiler code.

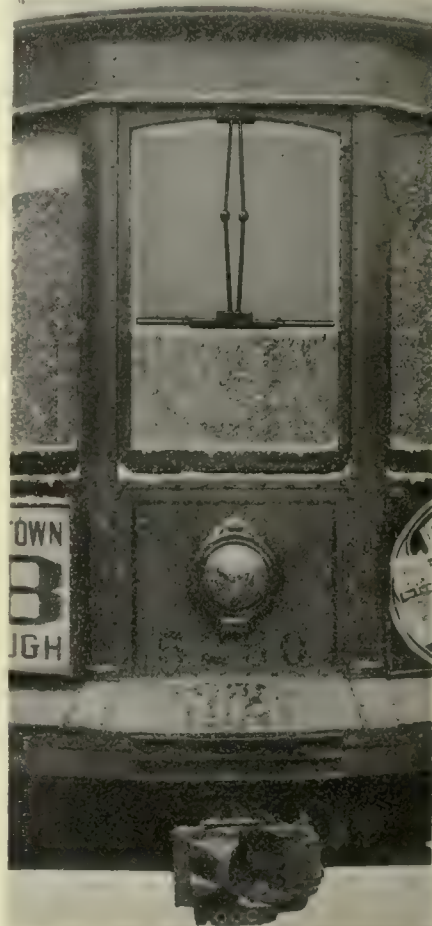
The burner is either of the gas type or the fuel-oil burning type, the former being recommended for use where natural gas is available or where the pressure of artificial gas is sufficiently high. In the oil-burning equipment fuel or furnace oil is used. Preheated water is fed to the boiler by means of a positive driven pump which is controlled automatically and maintains a constant level of water in the boiler. As a further precaution the controller is fitted with a low-water alarm whistle which gives warning should the water fall below the normal level.

Steam is piped from the boiler to the washstand where the steam hose is attached. A cold steam nozzle is provided which is provided with connections to both the steam and water lines. As steam is used at a pressure of about 150 lb., this passes through the nozzle and picks up and mixes with the water in whatever quantity desired. This quantity is determined by the operator according to the needs of the cleaning job and is adjusted by means of the nozzle.

Where it is desired to use some form of soap mixture or other liquid cleaner, hose lines may be attached to their containers and by turning a valve the contents are projected through the nozzle as desired. Two or three-way valves may be used in the water line.

Vertical Moving Window Wiper

SURFACE of 24 in. wide and 22 in. long is cleaned by a vertical window wiper which is a product of the Cinch Manufacturing Corporation, Chicago, Ill. This wiper was designed and perfected in co-operation with several electric railway companies where trials have been made. The principal feature of the Cinch ver-



Window wiper in its lowest position. It returns to the top automatically by spring pressure

tical swipe is that glass is cleaned by a vertical movement, so that rain or snow are carried downward and out of the way.

The movement of the wiping part is by means of a pantograph with two arms pivoted at the top of the sash. The outside pantograph frame is caused to move by the turning of a handle which is fastened to a shaft projecting inside the vestibule of the car. By turning the handle through an arc of 45 deg. the swipe is brought to its lowest position and it returns automatically to the top by spring pressure. In its normal position the swipe is at the top of the glass so as not to obstruct vision.

News of the Industry

Trial Run in Rochester's Subway

Following an inspection trip by railway and civic officials and industrial leaders in the first car ever operated by electricity over Rochester's new subway in the bed of the abandoned Erie Canal, it was announced that the line will start operation about Sept. 15.

It is expected that the interurban cars of the Rochester & Eastern and the Rochester & Syracuse Railroads will be the first to run in the city-built line. City surface cars will not be diverted into the subway until the signal system is completed about Dec. 1.

The Common Council favors operation of the line by the New York State Railways for a three-year trial period under terms similar to those that apply to the city trolley and bus lines, conducted under a service-at-cost contract.

The trial run was made from Winton Road at the extreme eastern end of the line to City Hall Station at the rate of a mile a minute. The entire 9 miles of the subway, which bisects the city, following the route of Clinton's "Big Ditch," was covered by the party.

The new line will not only take all interurban and much surface traffic off the streets, but will provide added switching facilities for industries along the line, under separate contracts to be made with the five steam railroads entering the city.

Civil Service Suggested for Detroit Employees

A movement has been started in Detroit which, it is believed, will ultimately result in the establishment of city civil service for employees of the Department of Street Railways. Del A. Smith, general manager of the D.S.R., recently asked the Corporation Counsel's office for an opinion as to whether the charter or the department regulations permit the discharge of employees because of nationality.

Mr. Smith is quoted as having stated that should the Corporation Counsel agree with the opinion that it is within the power of the Street Railway Commission to adopt any regulation it sees fit to govern the selection of employees, he would ask the commission to adopt a rule barring from the D.S.R. employ aliens who have had an opportunity to become citizens but have not availed themselves of it.

It is stated that 50 or 60 alien employees of the department have taken out their first papers. Mr. Smith believes that men not interested in the city sufficiently to become citizens should not be connected with a government department.

Mayor John W. Smith has announced that he will ask the Street Railway

Commission to place the D.S.R. under civil service, and an opinion has been received by him from the Corporation Counsel's office to the effect that it is mandatory upon the city to amend its Charter in conformance with the Home Rule Act, and establish a D.S.R. civil service system. The Corporation Counsel's office also has under consideration the request of the D.S.R. general manager regarding the status of alien em-

ployees of the D.S.R. and the opinion has been expressed that the D.S.R. has the right to make its own rules regarding aliens.

The Mayor's action is said to be opposed by officials and representatives of the Amalgamated Association. Following a brief meeting between them, the Mayor and union representatives declined to make any announcement about the outcome of their talk.

Expert Recommends Co-ordination for St. Louis

Report not made public, but Mayor reviews his attitude toward subjects about which differences of opinion exist

ROBERT M. FEUSTEL, who recently made a survey of the St. Louis railway situation at the request of Mayor Victor J. Miller, in a report submitted to the Mayor is understood to have recommended co-ordination of buses and street cars with a service-at-cost franchise as the best solution of the city's railway needs.

Mayor Miller has not determined whether a franchise shall be granted to the St. Louis Public Service Company when that organization takes over the United Railways properties, probably in October. The original plan of the reorganization committee of the United Railways was to secure a 30-year service-at-cost franchise for the new company with the right to earn 7 per cent on a valuation of approximately \$60,000,000. Subsequently this offer was withdrawn because the city administration had failed to act within the time limit fixed by the company.

The contents of the report of Mr. Feustel to Mayor Miller will not be made known at this time. However,

the Mayor and Mr. Feustel are said to be in agreement on the fundamentals of the St. Louis situation.

The suggestion of co-ordinated bus and railway transportation is not new for St. Louis. Several years ago the reorganization committee endeavored to purchase the competing People's Motorbus Company, but the parties could not agree as to price. Subsequently the reorganization committee formed the St. Louis Bus Company to supplement its railway service.

In this connection it is interesting to note that the Mayor is of the opinion that municipal ownership of the city's street car system would not solve the railway problem. The Mayor said:

This problem cannot be solved in a few days. Within the next five weeks I intend to have formulated a policy with regard to the properties of the United Railways, its ownership and future possibilities.

Urban railway transportation is in a state of change and it is very difficult to forecast just what transportation facilities will be most useful for the city within twenty-five or fifty years.

The city will probably employ several experts from other municipalities to aid in solving our problems. I intend to ask the Board of Aldermen for an appropriation for this purpose as soon as I can. I do not know as yet where we will go for our engineers and consultants.

Mayor Miller has outlined four ways of meeting the St. Louis railway problem. His suggestions briefly are:

1. Allow company to continue under existing franchises. This would make it difficult for the company to secure loans over a long period of time for financing and operation purposes.

2. Municipal ownership.

3. Semi-public ownership. Under this plan the city would build and own the facilities and lease them to an operating company.

4. Adopting of a service-at-cost franchise or some similar plan.

The city administration has favored a service-at-cost plan, but failed to

COMING MEETINGS

OF

Electric Railway and Allied Associations

Sept. 13-15—International City Managers Association, Dubuque, Ia.

Sept. 19-23—American Welding Society, national meeting, Book-Cadillac Hotel, Detroit, Mich.

Sept. 26-30 — National Safety Council, annual congress, Hotel Stevens, Chicago, Ill.

Oct. 3-7—American Electric Railway Association, annual convention, and exhibit, Public Auditorium, Cleveland, Ohio. Exhibits open at noon of Oct. 1.

agree with the reorganization committee of the United Railways on the valuation for rate making purposes or the amount of return the company should be permitted to earn. The reorganization committee asked for a 7 per cent return, but Mayor Miller contended that 6 per cent was sufficient.

Baltimore Hearings Started

The Maryland Public Service Commission started hearings on Sept. 6 on an application made by the United Railways & Electric Company, Baltimore, for an emergency increase in fares pending later action on the company's application for a 10-cent fare. The entire hearing was devoted to determining whether an emergency exists that necessitates an immediate increase.

Thomas J. Tingley, People's Counsel, led the opposition to the increase. Charles C. Wallace, City Solicitor, and lawyers for various organizations also joined with Mr. Tingley in opposing the increase.

Charles Markell, who represented the United, told the commission that the United had been operating since 1920 under rates that were confiscatory. He pointed out that the commission said several years ago that the company should earn a net of at least \$1,000,000, which would be a fair and reasonable return on its investment, but this amount was earned only in 1926, when the greatest economies were instituted. The income of the railway since 1920, he said, has fallen short of the minimum of minimums.

The company has been operating at zero and finds it cannot operate below zero, Mr. Markell told the commission. He denied that the number of passengers on short rides had decreased because of fare increases and also said that people ride in automobiles because they want to and not because of the car fare charged. Mr. Markell also declared that if the fare were lowered to 5 cents it would have no appreciable effect on the number of car riders.

Mr. Tingley replied to Mr. Markell and denied that the need of an emergency increase existed. He said the company had not instituted every possible economy.

Cites Court Decisions on Cost of Removing Conduits for Chicago Subways

Opinions rendered to the Chicago City Council on Sept. 2 by Assistant Corporation Counsel James W. Breen, indicate that the expense of removing and relocating pipes, wires and conduits in connection with subway construction or other improvements must be borne entirely by the public utility companies. Mr. Breen cited numerous Supreme Court rulings which sustain this requirement and refuse to allow such expenses in cases of subway building to be added to the subway rental and indirectly saddled upon the rider.

Convention Guests

MEMBERS of the American Electric Railway Association can extend the privileges of the Cleveland convention to their guests as in past years by registering them on the forms provided at the registration desk. Better still, guests should be pre-registered on the forms distributed to members some time ago. Use of the pre-registration cards will obviate the delay when entering the auditorium, as the badges will then be ready in advance and presentation of the duplicate card will complete the registration.

For those who wish to extend the privileges to guests for a single day only, guest tickets have been provided which will admit the bearer to the convention and exhibit. These tickets will be collected at the door. They are intended particularly for company members in Cleveland and vicinity which desire to have employees and others visit the convention without remaining for the entire time. They may be obtained on application to the executive secretary, J. W. Welsh, 292 Madison Avenue, New York City.

Problems of Salt Lake Company Explained

Rerouting of the Poplar Grove cars of the Utah Light & Traction Company, Salt Lake City, Utah, has been ordered by the Public Utilities Commission, the test to continue for a period of six months from the date on which it begins. This decision was reached at the hearing on the application of the company to abandon service and remove its tracks on Seventh South Street between West Temple and Eighth West Streets. The hearing was continued to the end of the six month test period. In the meantime, the tracks which the company sought to remove on Seventh South Street will be allowed to remain during the six months trial of the new routing.

Edward A. West, general manager of the company, testified that the cost of operating the cars over the section of road it was sought to abandon was \$1,085 a month, while the average monthly revenue on that section was \$370, leaving an operating loss of \$715. There are twenty railroad crossings over which the company's cars pass in going over the Seventh South line. It is largely to eliminate the maintenance of those crossings that the company desires to discontinue service on West Seventh Street.

Mr. West testified that many portions of the system were not paying and that to serve the public best those sections should be pruned from the system. He said the railway had been laid out before the coming of the automobile, and that the system now is too large for the demand of the public.

Salt Lake has 1 mile of trackage for each 1,200 people, while the average in cities of comparable size is 1 mile of trackage to each 2,000 inhabitants. Mr. West declared that average earn-

ings in Salt Lake are much lower than elsewhere, being only 30 cents per mile, compared with 44 cents per mile nationally. The maximum earned on any line in the Salt Lake system is 36 cents per mile, while the minimum is 8 cents. He declared that on the Seventh South Street line the average was 8 cents and that on the North Yard line it was 15 cents.

The commission will conduct a hearing at once on the application of the company to discontinue service on the Holliday line south of Thirty-third South Street. Hearing on the application to discontinue the Mill Creek bus line is also scheduled.

Reconsider Unlimited Term Franchise Bill at Chicago

A decision on the part of the local transportation sub-committee of Chicago, Ill., to reconsider its removal of the 40-year limit on franchises in the legislature marked the only new development in that quarter during the past week. The bills were drafted recently to facilitate settlement of Chicago's traction problems. In revising Senate bill No. 439, one of the Insull traction bills which was defeated in the legislature last June, the aldermen struck out the 40-year clause and substituted the recommendation that the City Council be empowered to grant a permit for 20, 50, 75 or any other number of years. Critics immediately assailed the measure, however, on the score that no protection would thereby be afforded against a perpetual grant. In consequence of this protest the sub-committee decided to reconsider its action at a subsequent meeting. The redrafting of the other 4 bills was completed on Aug. 31.

New Outing Bureau in Chicago Benefits Electric Lines

During the first month of its establishment, the outing and recreation bureau jointly maintained in the city of Chicago by the transportation companies and other local utilities under the management of Samuel Insull and associates has received and answered more than 16,300 inquiries about low-cost vacation trips in the metropolitan area, officials of the bureau recently announced. Telephone calls totaling 12,880 and approximately 3,500 personal calls for outing information were handled in that period and more than 38,000 pieces of vacation literature issued.

The bureau was opened on June 27 to furnish the public with suggestions for outings, vacations, picnic and sightseeing trips in and around Chicago. Attractive, inexpensive jaunts to many nearby resorts and parks have been mapped out by the bureau with full information as to costs, length of trip, things to be seen, etc. The service is free.

Striking window displays of vacation scenes and a large variety of folders

and maps describing the scenic and recreation facilities of the region have been used to promote the service rendered. Among the transportation companies interested in the bureau are the Chicago Rapid Transit Company, Chicago, North Shore & Milwaukee Railroad, Chicago, Aurora & Elgin Railroad, Chicago, South Shore & South Bend Railroad and the Shore Line Motor Coach Company. The bureau also serves as a consolidated ticket office for these companies.

Pennsy to Electrify Baltimore Lines

Electrification of the Pennsylvania Railroad in and near Baltimore within the next three years appears to be in prospect. George M. Smith, superintendent of the Baltimore division of the road, recently indicated that the company's roads in and near Baltimore will be electrified and the power used in operation of freight and passenger trains by 1930.

charges for street sprinkling, cleaning, sweeping and removal of snow and ice from the streets except from the tracks.

Wage Reduction Plea Rejected by Oakland Men

A proposal of the Key System Transit Company, Oakland, Cal., to its platform employees urging that they accept a reduction in their wages of 5 cents an hour has been rejected and the uniformed operators will stand by their agreement of two years ago with the company.

This was revealed following a meeting at which the executive committee presented the "suggestion" of the company to the men after debating the merit of the request for ten days.

It was announced that the reduction in wage was essential to the company because its financial condition is "desperate and critical" and that the need for economy on the part of the employees will remain for a year only. The alternative proposition that the employees keep their present wage and accept changes of hours that would result in a similar reduction was also voted down by the operators.

New Fare in San Antonio

A "compromise" schedule recently operative on the lines of the San Antonio Public Service Company, San Antonio, Tex., reduces the price of weekly nickel tickets from 30 cents to 25 cents, but otherwise leaves unchanged the fares, ranging up to 10 cents for adults. It places bus fares within the city limits on a parity with trolley fares (outside the city the fare is 2 cents additional on either bus or street car). The new rates also authorize sale of books, good for 30 days, giving children under seventeen years old forty rides for \$1.20 or 20 for 80 cents.

This "reduced" schedule of car and bus fares has ended, at least temporarily, a controversy waged since the San Antonio Public Service Company several weeks ago, increased cash fares from 6 cents to a maximum of 10 cents. All members of the City Commission failed to agree to the new schedule, which is in the nature of a compromise, but a deadlock in the commission prevailed to prevent proposed granting a franchise to a new bus concern that offered a 5-cent transportation. This deadlock also blocked a proposed independent audit of the present railway company's books. The company never conceded the city's right to require the latter's consent to a change of fares.

The increased car fare schedule, in effect since July 10, made the cash fare 10 cents, but provided for the sale of three metal tokens for 25 cents and for the sale at 30 cents of transferable tickets which permitted holders to ride for one week at 5 cents additional per ride. Children's rate was raised from 3 to 5 cents straight, and for school children under seventeen a 10-cent cash fare. In both cases a ticket rate was established.

One-Man Car Suggestion Opposed in Los Angeles

Local railway states its case against use of this equipment under peculiar conditions that exist in Pacific Coast Utilities

AT A RECENT hearing before the California Railroad Commission on the application of the Los Angeles Railway for increased fares, the chief engineer of the commission recommended the operation of one-man cars in Los Angeles as a measure of economy. Several different plans were proposed. They included one-man car operation throughout the city, and a zone plan operating two-man cars through the central district and changing to one-man operation outside.

The company is opposed to the suggestion. Figures in the hands of the railway show that the operation of one-man cars would not be a measure of economy in Los Angeles, particularly since the present type of equipment is not adapted to this operation. The engineering department of the railway estimates that the interest charge alone on the capital investment required to make the change would be more than \$170,000 a year, which must be deducted from any possible savings. The commission's engineers estimate that a year would be required to put the proposed system into effect.

According to the company there will be besides this the following, all militating against the proposal:

The additional cost of breaking in, as every man would have to be qualified not only as a conductor but as a motorman as well. The San Diego Street Railway reports that approximately 5 per cent of its trainmen cannot qualify for one-man car service. The percentage in Los Angeles would probably be about the same.

Additional supervisory, instruction and cash receiver forces to handle this work, with resulting heavy increase in payroll.

Difficulties of the operator having to stop to pull switches, plug them and going back to take plug out before proceeding.

Additional hazard at railroad crossings on account of flagging.

Greater delays in the case of accidents or blockades.

An increase in the possibilities of hold-ups.

Fenders of the present type are too heavy for one man to handle. This type of fender is used on account of a city ordinance and must be changed from one end to the other at every terminal every trip.

The opinion of the management is that on the Los Angeles system, with the extremely heavy passenger pick-up at many transfer points, and at practically all terminals it would be impossible for one man to handle the situation; and increasing layover time runs into a great deal of money. As the officials of the company see it the cost of one-man operation might be greater than operation under the present man power, not to speak of the easily figured inconvenience and delay to passengers and general street traffic. A loss of 1.38 miles in every car-hour means that during the average week day 10,000 fewer miles would be traveled under any of the suggested one-man operation plans than at present and 60 additional slower moving cars would be on the streets.

St. Paul Seeks Relief From Heavy Expenses

The St. Paul City Railway, St. Paul, Minn., is working for an amendment to the city charter to carry out a recommendation by the Minnesota Railroad & Warehouse Commission made more than a year ago that the city remit some of the expenses under the present charter in regard to paving. The company is now required to do work that costs \$56,000 a mile. It estimates that paving relief will reduce operating expenses \$115,000. This would make a more reasonable return to the company at the present rate of fare of 8 cents cash or 6 tokens for 40 cents.

It is the contention of the company that paving between the tracks began with the horse car, when the horse motive power wore out the road. Although the electric car does not do this the car rider is still saddled in that city with a charge that prevailed 50 years ago.

Under the proposed amendment the Council will be able to relieve the company of all paving and foundation for paving and maintenance of both; also to relieve the company of all

Railway to Resume in Mount Clemons

Railway service is to be resumed in Mount Clemons, Mich. Bus service operated on the streets for the past six weeks was termed unsatisfactory and the Detroit United Lines was ordered by the City Commission to place the line back into service. Petitions are being circulated in Lake township for restoration of interurban service on Jefferson Avenue. The service was stopped by the village of St. Clair Shores at the expiration of the franchise on July 21.

North Shore Line Provides Inter-Line Ticket Sales Service

A new interline ticket sales service whereby through tickets to any point in the United States served by a steam or electric railroad can be purchased at any of the company's passenger stations,

ber of the publication has sixteen pages. Four thousand copies of it were distributed to the employees.

240,000 Miles Without Accident

Ten employees of the New York State Railways, Rochester, N. Y., lines are now clad in brand new uniforms. It's all because they were careful.

The ten men comprise team No. 15 of the Federal Street division in the annual accident prevention contest of the railway. All trainmen of the Rochester lines were divided into teams of ten men each. To be eligible the ten men on the team must have operated a total of 3,000 days, or an average of 300 days each during the year. The winning team, captained by Theodore Hyde, operated a total of 240,000 miles for the twelve months without a chargeable accident. There were three other teams,



A careful crew rewarded for what it could do

has been started by the Chicago, North Shore & Milwaukee Railroad. Interconnecting ticket arrangements, including Pullman reservations with all steam lines in the country, have been established for the convenience of North Shore Line patrons. Arrangements have also been made with the Parmalee Transfer Company in Chicago for the free transport of North Shore Line passengers and hand baggage from downtown stations to all steam railroad terminals.

New Paper in Richmond

The first number of a magazine for the employees of the Virginia Electric & Power Company, Richmond, Va., has been issued. Nameless now, it will be christened by one of the employees. The employee who chooses the best name will be awarded \$10 in gold. A. H. Herrmann, Richmond, is editor of the magazine, and C. S. Stackpole, also of Richmond, and E. H. Will, of Norfolk, are associate editors. The first num-

one from the Federal Street division and two from State, which operated during the year without an accident, but they did not qualify in operating the required number of days.

Accident prevention contests are part of the safety work being carried on under the direction of Leon R. Brown, safety director of the Rochester lines of the New York State Railways.

Ohio Wreck Laid to Trainmen

Trainmen on the Dayton & Troy Electric Railway were at fault in causing a collision on that road near Dayton, Ohio, on June 25, according to a decision of the Interstate Commerce Commission's safety bureau. In the wreck four persons were killed and 39 were injured. The report also stated that in the opinion of the Commission an adequate block signal system on the line would probably have prevented the accident and that an automatic train stop system would have certainly done so.

To Smoke or Not to Smoke

Over this question the Georgia Power Company, Atlanta, Ga., has aroused a considerable argument. Some weeks ago "Two Bells," its official organ, published an article asking car riders to express an opinion as to whether or not its present "No Smoking" rule should remain in force.

In view of the increasing number of women who smoke, officials were seriously considering a change in the rule. But the referendum, in addition to arousing public interest in the affairs of the company, has brought out the fact that a large majority of the riders are opposed to smoking on the trolley and a still larger number are opposed to allowing women to smoke there! The question whether women should be allowed to smoke has almost made a side issue out of the original question.

Danbury Company Will Sell Certain Franchise Rights

The Danbury Power & Transportation Company, Danbury, Conn., has asked the Public Utilities Commission for approval of its proposed plan to sell its franchise rights for distribution and generation of electricity, and its power plant and equipment to the Danbury & Bethel Gas & Electric Company. The petition states that the seller is to reserve to itself its rights to maintain and operate a transportation system.

Superior Fare Hearing Deferred by Commission

The hearing by the Railroad Commission on the request of the Duluth Street Railway, Duluth, Minn., for higher fares in Superior, Wis., has been postponed to late September. The company contends that the present cash fare of 10 cents or five tickets for 30 cents is insufficient to produce a fair net return.

Opening of Philadelphia Tube Delayed

The North Broad Street subway of Philadelphia, Pa., built by the city at a cost of \$100,000,000, will not be placed in operation before next May. This was disclosed recently by officials of the Philadelphia Rapid Transit Company which will operate the line. City engineers, it was said, were in accord with the company's findings contained in an engineering survey that the city-built tube could not be ready for regular train service before the expiration of Mayor Kendrick's term in office. Delay in installing the signal system and other essential equipment and failure to provide adequate terminal facilities for through operation under City Hall before the South Broad Street unit is completed were the factors cited by the Philadelphia Rapid Transit Company experts as contributing to the delay.

Loud Speaker in London

Two cars of a train on the Charing Cross & Hampstead section of the London Electric Railway have been fitted with loud speakers. One car has a horn under the roof and the other has a double-mouthed rectangular speaker from which the sound emerges in two directions. The guard has a mouthpiece into which he speaks, giving information on the next station, and connections which can be made there. Tests are being made on the same sort of equipment to give communication between guard and driver.

Electric More Economical than Steam in Switzerland

Twenty thousand tons of coal are being saved yearly because of the adoption of electric railway service in Switzerland. Directors of the Rhätian line, which extends for 173 miles and which has been operating for the last five years, have reported other economies. According to their statistics a reduction of 52 per cent is being made in the engineering staff at the workshops for the maintenance of electric locomotives; 48 per cent in the track maintenance department and 43.5 per cent in the service personnel.

Railroad Electrification in Austria

The Austrian State Railroad authorities are planning two new schemes of railroad electrification. The first scheme will occupy a period of five years in completion. It will involve about 380 miles on the Vienna-Salzburg and Vienna-Gratz-Nauer lines. In the second plan a total of about 475 miles will be electrified.

Halfpenny Fares Restored in Glasgow

The halfpenny fare, which was abolished in Glasgow in 1920, was reintroduced last month by the Town Council. This 1-cent charge covers one stage, or half a mile. Heretofore two stages, or about a mile, were obtainable for a halfpenny. The present move is regarded as experimental and has been recommended as such by the general manager, although the adoption of the 2 d. fare for any distance beyond the 1 d. stage has proved very successful, resulting in the increase, it is believed, of £82,196 in the tramway traffic revenue for the financial year ended May 31.

Bus Proprietors Propose Plan to Middlesex

The London Omnibus Proprietors Association has proposed to the Middlesex County Council to institute a system of bus operation. For the last two or three years the Metropolitan Tramways has been operating the Middlesex

cars at a loss, due chiefly to bus competition, it is believed. For this reason there seems to be doubt whether the lease, which expires in 1930, will be renewed. According to the secretary, the association would be prepared to participate in a reasonable scheme of compensation by annual tax or donation to the County Council for loss of capital, and it is prepared to cover a system of fares and timings intended for workmen.

Trolleys More Profitable than Buses in Brisbane

Much of system rebuilt since city took it over about four years ago

THE annual report of the Tramways Department of the Brisbane (Australia) City Council gives £178,672 as the net revenue from railway and bus operation for 1926, but after deduction of interest, depreciation and other fixed charges, the deficit was £7,748, compared with a deficit during 1925 of £26,395. The bus operating revenue was £16,750. There was an increase of £61,188 in total revenue during the year. The increase in operating expenses, according to the report, is due to the operation of the 44-hour week for the full year and to additional services to the public.

Since the purchase of the property by the municipality four years ago, 38 miles of new track has been laid, 71 new cars have been built and other improvements have been made. Further extensions to the rolling stock and new shops are recommended. On the bus situation, the report refers to the loss from operation during the year (£5,631) on the eleven buses used, and says that individual operators have a better chance at success, as the drivers will work longer hours. It then proposes that the municipal bus service be abandoned, presumably under conditions by which private buses would be employed in their place in supplementary rather than in competitive service.

Electricity for South Manchurian Railway

The South Manchuria Railway, Shanghai, China, is now planning electrification of a part of its system. This decision follows experiments on the line serving the Fushun collieries, where the electric railway system has been giving more favorable results than steam locomotives.

At Anshan, Manchuria, where the Anzan Iron & Steel Works are situated, electric locomotives have been put in use for carrying ore from the Takushan mine, also with favorable results.

The first section to be electrified will be the Fushun branch line, which joins the main line at Suchiatun Junction. This will be followed by the Suchiatun-Mukden section on the north and by the Suchiatun-Liaoyang section on the south.

After the program mentioned above has been carried out, the shunting engines on the Dairen wharves will be the next to be electrified. Plans have been made to increase the electric power supply at Dairen by 10,000 kw. in order to meet in part the need for service to the electric railways planned.

York Shows Falling Off in Travel

Figures from York Municipal Tramways, England, for the year ended March 31, 1927, show a decrease of 1,000,653 tramway passengers and of 4,681 railless passengers. The municipal buses carried 207,618 more passengers than last year, but the total figures for passengers carried, 8,357,572, was 797,716 less than in the previous year. There was an operating income, after deduction of expenses, but after the charges for interest and sinking fund there was a total deficit of £5,013 from all three services.

Expenses Increase on Belgian Light Railway

According to the report of the Société Nationale des Chemins de fer Vicinaux for 1926, expenses have gone up, due largely to the devalorization of the Belgian franc, while it has been impossible to increase charges as rapidly. The Société Nationale is a large railway system extending through all parts of Belgium, with 4,361 km. (2,739 miles) of track. The gross earnings in 1926 were 157,871,463 francs and the expenses 149,668,993 francs. This gives an operating ratio of more than 94 per cent as compared with 90.68 per cent in 1925. Rates have now been increased, however, the second class passenger rate per kilometer from 0.13 to 0.22 francs and the first class rate from 0.17 to 0.28, with corresponding increases in the freight rates. The system has 649 electric motor passenger cars and 613 trail passenger cars, but the greater part of the property is still operated by steam. The steam equipment includes 836 locomotives and 2,014 trail passenger cars. Thirty-six motor buses have been put in service.

Liverpool Reports Slight Gain in Revenue

The report of the Liverpool Corporation Tramways for the twelve months ended March 31, 1927, gives receipts from passengers as £1,389,150, a gain of £5,189 over last year. The passengers carried were 247,608,127, a gain of 440,119 over 1926. The total revenue of the system for the year was £1,436,805.

After payment of interest, sinking fund requirements and repayment of loan, there was a surplus of £157,443. Wages constituted 46.5 per cent of the total revenue. The 1 penny ticket represented 68.30 per cent of the total number sold. Next comes the 2 penny ticket with 30.03 per cent.

Recent Bus Developments

Indiana Commission Defines Its Powers on Bus Operation

In an opinion to F. T. Singleton, chairman of the Indiana Public Service Commission, Arthur L. Gilliom, Attorney-General of Indiana, held that the City Council of Indianapolis had no authority to limit the power of the Public Service Commission, concerning the bus law under which the commission grants permits for the operation of bus lines. The question was raised in connection with a motion filed by the Indianapolis Street Railway to dismiss a petition by the Hoosier Transportation Company to take on and discharge passengers within the city limits. The motion of the railway points out that a city ordinance prohibits buses taking on or discharging passengers on streets used by interurban or street cars, unless the buses are operated by the street car or interurban companies. Mr. Gilliom said the commission alone had power to determine who might give service in such streets.

Council Versus Commission in Lincoln

The Lincoln Traction Company, Lincoln, Neb., has run against a snag in securing permission from the City Council to comply with authority received from the State Railway Commission to substitute bus for railway service on its Beach, South Fourteenth and North Tenth Street lines. The Beach line crosses a viaduct three blocks long over the tracks of the Burlington and the Union Pacific Railroads west of the city. The company started buses over this structure before it got the Council's permission. In the division of authority the state commission controls service and rates, while the city governs the use of streets. The Council wants the railway to give bond to replace or repair that portion of the structure used by it. The company asked that nothing be done until the end of the 90-day experimental period, but the Council finally demanded a \$6,000 bond before it would permit buses to be operated by the railway, over the structure.

Jitney Operation Sought in Miami

Petitions for the repeal of the ordinance which rules jitney from downtown zones in Miami, Fla., and for the re-enactment of the previous ordinance were presented to the City Commission on Aug. 15. The petitions, containing 6,100 names and 4,200 names respectively, were filed with H. E. Ross, city clerk. Mr. Ross will check the names on the petitions against the list of voters. Under the old ordinance governing jitney operators, special permits and

licenses were required as well as proof of the dependability of all drivers and motor vehicles used. Fifteen per cent of all registered voters must sign a petition for a referendum and 10 per cent for an initiative election for the passage of new ordinances.

Further Co-ordination in Westchester County

Leverett S. Miller, president of the New York, Westchester & Boston Railway, proposes to solve the transportation problem of Westchester County northward from White Plains through Brewster, N. Y., and Danbury, Conn., by the establishment of motor coach feeder lines, rather than by the extension of existing railway lines. Mr. Miller's opinion was contained in a communication to L. Ward Prince, president of Prince & Ripley, who had asked, on behalf of Westchester realtors, that the New York, Westchester & Boston extend northward its western division all-electric commuter service now terminating at White Plains. In his letter to Mr. Prince, Mr. Miller said:

You are familiar, I know, with the fact that this company originally contemplated the extension of its lines from White Plains to Brewster and Danbury. Within the last few years the company was faced with the obligation of completing its routes, both from Larchmont to Port Chester, and from White Plains to Brewster and Danbury within the time limit specified by law, or lose its franchise rights.

To accomplish this would have required the expenditure of many millions of dollars. The time did not seem propitious for the extension to Brewster and Danbury, but the extension from Larchmont through Mamaroneck, Harrison and Rye to Port Chester appeared warranted.

It was for this reason that the railway sought remedial legislation to relieve it of the obligation to build to Brewster and Danbury. At present-day prices it would cost to build these latter extensions double the estimate made at the time these lines were first considered.

In the meantime, much of the remaining undeveloped property to the south and east of White Plains has come into the market, and the growth to the north undoubtedly now will increase. But I do not believe that it is yet of sufficient extent to warrant a rail line such as was originally contemplated.

It seems to me that the more practicable solution of the transportation problem for this section is through the use of motor vehicles co-ordinated with the existing rail lines, to be followed later by the extension of the rail lines as soon as the traffic may warrant.

You refer to present-day values of land in this section and the very large increase that would result in values if transit facilities were furnished. Transportation must, to a certain extent, be a pioneer in such development, but it cannot carry the load for too long a period.

As you say, the property owners would be well repaid if they were to underwrite

the cost of such an extension, but, as you also remark, they won't; they will expect the transit lines to carry the bag. The development through motor vehicle transportation would require far less investment, and consequently the underwriting by property owners in such an undertaking might be more favorably considered by them.

The working out of these problems requires the co-operation of realtors interested in the development of the section and those connected with the transportation companies. We all have a common interest in the development of the section which it seems cannot be efficiently accomplished without such team work.

Rights for Morris County Traction Company

Joseph P. Tumulty and Joseph K. Choate, receivers for the Morris County Traction Company, have been authorized by the Board of Public Utility Commissioners to substitute buses in place of trolley cars over the lines from Landing, Morris County, to Maplewood, N. J.

It is proposed to use 35 buses. A similar application was granted last year involving the company's line between Elizabeth and Springfield. By the application just granted five routes will be created for the company's buses. The fare will be 10 cents in each zone, the same rate as on the trolleys.

The bus service must be started within a reasonable time, the board ruled, adding that it reserved the right to order the removal of poles, overhead trolley wires and tracks and the replacement of pavements.

At the hearing on the application it was contended that permission to run buses would add value to the property of the company. Such a contention, the board held, was secondary to the question of providing adequate transportation. The decision said:

The board does not propose to approve these permits merely to permit the receivers or bondholders' committee to take advantage of that fact and to speculate with them, but will impose a condition that unless the buses are actually provided and that transportation is furnished over the route now covered by the trolleys the approval will be withdrawn.

Rehearing Sought on Albany Fare Grant

A petition for rehearing was filed with the Public Service Commission on Sept. 2 by Mayor John Boyd Thacher of Albany, N. Y., on the order of the commission adopted on Aug. 4 permitting a 10-cent fare to be charged by the Capitol District Transportation Company, Inc., on its bus lines. This company is a subsidiary of the United Traction Company. The rehearing petition alleges a number of particulars in which it claims the order was not warranted by the evidence taken in the case. It is expected that action on the city's application for rehearing will be taken at an early date. A similar petition has already been filed on behalf of the city of Cohoes.

Route in Minneapolis Changed

With an order from the Minnesota Railroad and Warehouse Commission to make a 12½-cent token fare for local travel on the Selby-Lake line of the Twin City Motor Bus Company in Minneapolis, Minn., the route is to be changed, according to suggestion of the commission, so as not to be in direct competition with the Selby-Lake interurban railway. A similar fare and rearrangement of bus route had already been ordered for St. Paul and the proposed new bus route had been approved by the City Council. The through fare and local cash fare is 25 cents. The company expects to increase the bus fleet on this line from fourteen to eighteen or nineteen.

The new route is ¼ mile longer in Minneapolis and four blocks longer in St. Paul, which will add about ten minutes to the running time between terminals. The Twin City Motor Bus Company is a subsidiary of the Twin City Rapid Transit Company.

Group or Party Buses in Reading

The Reading Transit Company, Reading, Pa., has in service two buses which are available to groups or parties for trips out of town. These buses of the latest type have a seating capacity for 29 people each. Application can be made to the transportation department for service and rates for trips within a 50-mile radius of Reading.

Wisconsin Patrons for and Against Buses

Sentiment of the people at a public hearing on the proposal of the Wisconsin Public Service Corporation to substitute bus service for the electric interurban service between Green Bay and Duck Creek, Wis., was equally divided for and against such substitution. Action was delayed until further evidence of the sentiment of that section could be obtained.

New Buses Operating in Milwaukee

Two new buses of the very latest type have been received and placed in service on the Lincoln Avenue line of the Milwaukee Electric Railway & Light Company, Milwaukee, Wis. These buses are operated by twin engines. Each has a seating capacity of 40 passengers.

Hearing Held on Troy Bus Line

Public Service Commissioner Lunn held a hearing on Sept. 6 on the petition of the Capitol District Transportation Company, Inc., for a certificate of convenience and necessity for the operation of a bus line in the city of Troy, N. Y., which will be an extension of the present bus system of the company and will afford transportation facilities to a section of the city in which the

United Traction Company, the parent company, proposes to abandon railway service. A hearing on the proposed abandonment of the trolley route in Fifteenth Street between Hoosick and Congress Streets was held before Commissioner Lunn at the same time as the bus application. There was no opposition to either application at the hearing. The decision of the commission will be announced later.

Buses for Local Service in Detroit

Effective on Oct. 1 the Detroit Municipal Railway, Detroit, Mich., will reduce the street car fare to Redford to 6 cents from 10 cents, making the former amount the prevailing fare throughout the city. Several new bus lines have been decided upon and express street car service will be instituted on Sept. 18 on a main artery in the easterly side of the city. The buses will stop at each block and will carry the loads to the next station at which the express street cars stop. A free transfer from the buses to the street cars will be given. Loading stations for the express cars will be built similar to safety zones, but will have canvas tops and sides. In the opinion of the general manager this may aid materially in reducing the number of accidents resulting from persons being hit while attempting to cross from curb to safety zone.

While the department has been figuring on instituting such service for several months it has not been deemed advisable to attempt high speed on Jefferson Avenue and other lines due to the condition of the tracks. The new roadbed has been completed in Jefferson Avenue and the express service will start there first. Construction gangs are now replacing the roadbed in Woodward Avenue and if the Jefferson project proves successful, the higher speed service will be used on the main artery. Del A. Smith, general manager, said:

The research which the department is conducting in connection with the co-ordination of street cars and motor coaches has convinced us that such a plan is not only entirely feasible, but highly desirable.

Mayor Smith said:

We all know that rapid transit in the form of subways cannot be achieved in Detroit for several years, and for that reason the D.S.R. is making every effort possible to speed up service. The day is past when we figure distance by miles; we figure it now by minutes and if the time required to carry passengers from one point to another can be reduced, the municipal system is benefitting its patrons.

The Street Railway Commission also approved coach service on the Six Mile Road between Woodward and Wyoming Avenues, and extension of the present service on the Seven Mile Road westerly from Wyoming Avenue to Lasher Road. Both these extensions invade territory annexed to the city during the past few years.

The commission also approved coach service on Schoener Road, between State Fair and Gratiot Avenues; and

on Connors Avenue between Six Mile Road and Kercheval Avenue. Both lines will go into operation on Sept. 12. This service will be in force only during the morning and evening rush hours, but will be extended as traffic increases.

Buses for Kansas City, Kan.?

Buses of the single-deck type are proposed for operation in Kansas City, Kan., representatives of the Kansas City Public Service Company informed the city commissioners on Aug. 4, in executive session with Mayor McCombs of Kansas City. The buses would serve the districts in the north and west parts of the city that have no adequate transportation facilities. If the plan goes through the buses will be given a six months trial and would be continued if patronage justified the expense, it was reported.

Toledo Bus Ordinance in Abeyance

Enforcement of the new ordinance in Toledo, Ohio, against handling of intracity passengers by interurban buses has been held up through continued postponements in the municipal court of the 40 or more cases that have been initiated against drivers who violated the ordinance. The ordinance has been upheld by the courts of the state. Meanwhile the Community Traction Company has gone ahead with its city bus service for West Toledo, but is suffering from competition of interurban bus lines operating a few miles beyond the city limits.

Coach Service Extended in Wisconsin

Motor coach service, replacing interurbans on runs between Oshkosh and Fond du Lac and Oshkosh and Neenah, Wis., has been placed in effect by the Wisconsin Power & Light Company. Electric railway equipment will be retained, and the track will be used in emergencies or will be restored to regular use if the demands for service appear to justify it.

Ban on Parking Buses Lifted Partly

The peremptory order to interurban bus companies using the streets of New York City as terminals to find stations not on the public thoroughfares has been modified by Police Commissioner Warren, who extended the time limit indefinitely from Aug. 1 for lines which are building terminals but have been unable to complete them. With the opening of the Holland Vehicular Tunnel the commissioner believes there will be a great increase in interurban bus lines. Lines which have made no attempt to obtain terminals will receive summonses for obstructing traffic. Sept. 15 is the new date fixed in the ban against parking.

Financial and Corporate

Commission Hears St. Louis Reorganization Plea

The Missouri State Public Service Commission has under advisement the application of the St. Louis Public Service Company for approval of its plans for the reorganization of the United Railways properties in St. Louis, Mo. The new company recently purchased the United Railways holdings for \$49,601,000.

United States District Judge Faris, who has jurisdiction over the receivership, has already approved the general plan of reorganization. The company is expected to emerge from receivership within 60 days.

The commission conducted a hearing on the application on Sept. 2. At this session it developed the new company plans to issue securities in addition to the \$52,414,862 heretofore provided for, but specific plans for the additional financial obligations were not revealed at the hearing.

The commission also sought definite information concerning the cost of reorganizing the properties, but Stanley Clarke, counsel for the reorganization committee, stated that there is no way of finally estimating such cost at present. The expenses of the reorganization to date have totaled approximately \$895,000, but that amount will be increased before the complete reorganization is perfected.

During the period of reorganization the committee has maintained offices in the Liberty Central Trust Building, St. Louis, and has employed a force consisting of three attorneys, two engineers, a secretary, stenographers and other office help. This force has taken no part in the operation of the company under the receivership, which has been in charge of Rolla Wells and Col. Albert T. Perkins, his general manager.

Counselor Muench for the city took the position that the application of the new company was premature and too indefinite and that under it the commission could only issue an "If and when order." He cross-examined all witnesses for the company.

Walter E. Bradley, secretary of the reorganization committee, testified that the majority of the holders of securities of the old company had approved the reorganization plan. He estimated the percentage of assent as follows: Transit company securities, 99.76 per cent; Suburban company bondholders, 87 per cent; United Railways preferred stock, 96 per cent, and United Railways common stock, 89 per cent. All classes of security holders will participate in the readjustment of the company's financial structure and none of the securities to be issued by the new company will be sold to the general public. He said that all of the stock of the new company

has been subscribed by the present security holders.

The new stock will include 73,193 shares of preferred and 342,645 shares of common. Of the preferred stock 19,000 shares will be used to pay off unsecured claims against the old company on the basis of 66⅔ per cent if such stock is accepted in payment. If not, the claims will be paid off on the basis of 33⅓ per cent in cash. Mr. Bradley said that with the exception of the city of St. Louis, all of the unsecured claim holders have elected to accept stock in payment. Such claims total \$466,471. The testimony developed that no funds have been set aside to take care of the mill tax judgment.

The new company will have total bonds of only \$40,800,000 as against \$54,890,000 of bonded indebtedness of the United Railways. New bonds to the amount of \$4,500,000 will be issued at this time to refund a like amount of Suburban company bonds. Mr. Clarke testified that the cash in the hands of Receiver Wells would not reach the estimate of \$4,500,000 made when the committee first announced its reorganization plans in October, 1924. The total amount of cash now in the hands of Receiver Wells was not revealed at the hearing, and it was stated the probable deficit in cash for the reorganization could not be definitely estimated at present. Mr. Clarke said:

We probably will have to ask the commission for authority to sell additional preferred stock or prior preferred stock, or some short term notes to make up the deficit in the cash requirements of the plan.

A shrinkage of earnings during the last three years accounts for the lower amount of cash held by the receiver.

Later it was estimated the company would require at least another \$900,000 in addition to the cash now available.

The total securities of the new company including bonds and stocks will be \$52,414,862 compared with \$93,886,000 in securities of the old company now outstanding. The \$16,383,000 in preferred stock and \$24,913,000 common stock of the United Railways were eliminated in the reorganization plan.

New Owners in Beacon

The Fishkill Electric Railway, controlled by the Central Hudson Gas & Electric Corporation, has relinquished the Beacon, N. Y., railway system to a local syndicate headed by Attorney James G. Meyer and Mayor Macomber. The line covers 7 miles. The fare is 7 cents with no transfers. It is stated that the operating company might find the burden of Main Street paving somewhat burdensome and complications might develop affecting adversely the future of the trolley.

Traffic, Fare and Wage Figures

Traffic on the electric railways continued to fall off during July, compared with July, 1926. The decrease was the heaviest of any month in 1927 thus far. The number of revenue passengers, including bus passengers, reported to the American Electric Railway Association by 219 companies for July, 1927, compared with July, 1926, is as follows:

July, 1927.....	773,232,934
July, 1926.....	803,981,889
Decrease, per cent.....	3.83

Average cash fares in cities of 25,000 population and over:

	Cents
Aug. 1, 1927.....	7.9223
July 1, 1927.....	7.8966
Aug. 1, 1926.....	7.6946

Average maximum hourly rates paid motormen and conductors in two-man service by companies operating 100 or more miles of single track:

	Average Hourly Rate Cents	Index Number 1913-100 Per Cent
Aug. 1, 1927.....	57.23	210.02
July 1, 1927.....	57.19	209.87
Aug. 1, 1926.....	56.87	208.70

Dispute Over Applicability of Funds for Income Bond Payment

Thomas B. Jenkins, of Richmond Ind., owner of \$35,000 par value adjustment mortgage 5 per cent income bonds of the Third Avenue Railway, New York City, is bringing suit in federal court to compel it to pay full 5 per cent interest and 27½ per cent accumulated back interest and to prevent it from going into the bus business until the bonds are paying full interest and the accumulation is wiped out. Suit will be brought on behalf of himself and all other bondholders, but Mr. Jenkins has already filed a suit in state court, asking that the company be compelled to pay interest due on his bonds. In urging others to join him Mr. Jenkins issued this appeal:

On Oct. 1, 1927, a total of 30⅓ per cent interest will be due on the adjustment mortgage 5s, amounting to \$6,836,000. Of this accrued interest 1⅓ per cent, or \$275,000, has been ordered paid, leaving an arrearage of \$6,561,000, or 29⅓ per cent.

According to the company's published reports, full interest of 5 per cent has been earned on the adjustment 5s in the past two fiscal years, with a surplus, after interest, of around \$300,000. Only 2⅓ per cent has been paid or ordered paid in each of these two years.

According to the same reports, the surplus income of the company available for the payment of interest on these bonds accumulated since 1917, but unpaid, is approximately \$4,500,000, or 20 per cent on the outstanding bonds.

The company has been operating bus lines in Westchester County and, not only are said bus lines operating unprofitably, but they were financed out of the company's treasury with funds which legally belong and should have been paid to the adjustment bondholders. Officers of the company admit that they contemplate an extensive bus venture in the Bronx, requir-

ing considerable further capital. This venture, they also admit, will probably prove unprofitable. The financing of this venture, they state, is to be accomplished through the hypothecation of securities now held in the company's treasury, which were bought with cash from the company's treasury, and which I am advised by counsel ought to be applied to the interest due the adjustment bondholders.

As an owner of the adjustment mortgage bonds, I have employed counsel to estop the company from using the property of these bondholders for capital purposes, in direct violation of the trust indenture securing the bonds, and also to bring legal action against the company, to force it to pay the earned but withheld interest on the bonds.

My attorneys are Barber, Fackenthal & Giddings, 120 Broadway, and I hereby invite all owners of these bonds to join with me in an association for mutual protection.

No deposit of bonds will be required. Please communicate with me in care of my said attorneys or with said attorneys. Telephone—Rector 4573.

A statement by the company says:

The past year has been an eventful one for the companies of the Third Avenue Railway System. Much of the uncertainty as to the future, occasioned by threatened bus competition has been cleared up and the future never seemed more assured or brighter.

Operations for the year ending June 30,

1927, showed approximately \$250,000 above 5 per cent on the adjustment bonds. This showing was abnormal in the respect that there was a substantial increase in receipts and in net due to the Interborough strike which occurred during that year, temporarily diverting travel to the Third Avenue lines.

It has been necessary in order to avoid the sale of securities at a sacrifice to finance all the operations of the companies for the last ten years out of surplus.

During the past year among other extra disbursements approximately \$300,000 was paid on account of paying bills of previous years which has been in litigation and also it was necessary to pay \$350,000 on account of capital expenditures, making approximately \$650,000 paid out of the year's surplus for expenditures not chargeable to operating expenses.

At the present time the companies of the system have in the treasury available for all purposes approximately \$1,500,000. This is outside of its own securities which were bought and placed in its treasury more than ten years ago.

From this it will be seen that although the future of the companies of the system seems assured, the cash available for all purposes has not been increased during the past year. Under the conservative policy which has characterized the management, it is advisable to conserve this cash surplus. This is more urgent by reason of the increase of wages that has been going into effect during the past few months.

was commenced in May, 1925, has been greatly extended during the past year. A total of \$132,008 was obtained from this source in 1925. In 1926 the gross income was \$300,811. There has been a surplus each year from the operation of motor coaches.

Various classes of service which were operated in 1925 were continued in 1926, including sight-seeing trips, the chartering of motor coaches to private parties, coach transportation to the race tracks and to the Canadian National Exhibition, transportation of school children, and a regular scheduled service to the "Hill" district. In addition, there was inaugurated in July a regular service between Toronto and Niagara Falls. All of these services, which are operated as a separate undertaking and distinct from the street railway and bus transportation, have proved to be very popular, although the rates charged are in all cases necessarily in excess of the rates charged on the street railway. As many as 49 coaches have been chartered in a single rental contract.

Operating expenses of the commission for the year 1926, including the cost of electric current, maintenance, repairs, administration and taxes, but exclusive of the operation of motor coaches, amounted to \$7,297,367. This total compares with \$7,292,298 in 1925.

The Transportation Commission purchases all the power for operation of the railway from the Toronto Hydro-Electric System, which in turn purchases from the Hydro-Electric Power Commission of Ontario. The average cost of power to the Transportation Commission, converted and delivered as direct current was 1.40 cents per kilowatt hour in 1926. The aggregate amount paid for purchased power was \$1,077,277.

Annual charges for interest and sinking fund on the debenture debt increased in 1926 approximately \$125,000 over the requirements of the year 1925. In addition, it was necessary to appropriate a large amount for the replacement reserve. The large annual increases in the debt charges, which have been referred to in previous reports, will not continue beyond 1926 unless the commission is obliged to increase the debenture debt. A policy to which the commission has consistently adhered since the commencement of operation is that extensions or additions to the system should not be made unless they will earn sufficient additional revenue within a reasonable period to meet all the expenses of operation and fixed charges on the new capital. If extensions are made without regard to economic considerations, the fare will inevitably have to be increased.

The expenses of operation of motor coaches totaled \$211,548, resulting in a net income of \$89,262, which was more than sufficient to meet all fixed charges on the capital invested including an adequate allowance for depreciation.

The mileage operated by street cars and buses, but not including motor coaches, aggregated 25,533,893 miles in 1926, an increase over the mileage in 1925 of 286,835.

Traffic Increase in Toronto

Transportation Commission's report covering operation of municipally-owned system sees improvement in general business reflected in the operations for the year 1926

IN ITS fifth annual statement covering the operations of the year ended Dec. 31, 1926, the Toronto Transportation Commission, Toronto, Ont., points out that the surplus of \$76,951 was slightly more than one-half of one per cent of the gross revenue. The accumulated surplus as of Dec. 31, 1926, was \$248,371.

The gross income was \$12,050,304, an average of more than \$1,000,000 a month and the largest in the history of the commission. The increase over 1925 was partly due to the increased development of motor coach traffic and partly to an improvement in general business conditions in the Toronto district. The revenue passengers were 183,494,076, a gain of 2,714,151 over 1925, but the total number carried for 1926 was still more than 5,500,000 passengers below the record established in 1923.

The investment in capital account, as of Dec. 31, 1926, was \$45,350,484. Capital expenditure in road and equipment totals \$39,374,813 as of Dec. 31, 1926. The net additions to the property accounts during the year were slightly more than \$600,000, all of which were financed by the commission without increasing the debenture debt and without disturbing the invested capital funds held in trust for the commission by the City Treasurer.

The amount carried on the books classified as "Franchise and Other Intangible Assets" now stands at \$4,375,-

449 as of Dec. 31, 1926. This item has been referred to at length in reports of previous years. The amount represents payments the city has been forced to make for the property of the Toronto Railway in excess of any reasonable valuation and for franchises and rights of certain radial railways which previously operated within the city limits. In line with the policy adopted by the commission in 1925, this large item is being amortized as rapidly as conditions will permit.

The commission in 1925 applied \$941,941 of the accumulated reserves toward the reduction of the intangible assets. In view of the small additions to the capital accounts and the fact that no large replacements will be necessary in the near future, it was possible to make a further reduction of these assets and an additional amount of \$834,844 was therefore applied to this purpose in 1926. During the last two years the intangible assets have been reduced by \$1,776,785.

The reserve for replacements, as of Dec. 31, 1926, amounts to \$2,811,412. In the revenue accounts for 1926 there has been appropriated from net income the sum of \$998,911 for the purposes of this reserve. The net funded debt less funds transferred to the City Treasurer for redemption of debentures is \$39,640,679 as of Dec. 31, 1926, a reduction of more than \$1,000,000 from the position at the close of the year 1925.

The operation of motor coaches, which

COMPARATIVE OPERATING STATEMENTS OF THE TORONTO TRANSPORTATION COMMISSION

Gross Income	
1921*	\$4,071,969
1922	11,651,512
1923	11,852,334
1924	11,709,695
1925	11,626,658
1926	12,050,304
Operating Expenditures	
1921*	\$2,499,773
1922	8,468,841
1923	8,104,680
1924	7,788,563
1925	7,387,570
1926	7,508,915
Net Income	
1921*	\$1,572,196
1922	3,182,670
1923	3,747,654
1924	3,921,131
1925	4,239,087
1926	4,541,388
Interest and Redemption of Debt	
1921*	\$642,805
1922	1,837,977
1923	2,387,725
1924	2,733,385
1925	3,081,703
1926	3,273,045

* Four months.

The largest adjustment in the surplus account during the year was the transfer of \$193,638 to the reserve for replacements. The report states that if sound business principles are to be followed, it is imperative to create proper reserves and to amortize the relatively large amount of intangible assets before accumulating any substantial surplus.

During the year 1926 the average fare collected on the Toronto Transportation System was 6.16 cents. Its distribution was as follows:

	Cents per Passenger	Per Cent of Cost
Maintenance of track work, overhead and structures.....	0.366	5.93
Maintenance of equipment.....	0.506	8.21
Power.....	0.653	10.58
Operation of cars and buses.....	2.139	34.72
Tickets and transfers.....	0.040	0.65
Insurance.....	0.030	0.48
Taxes, legal and miscellaneous expenses.....	0.091	1.50
General offices and accounting.....	0.137	2.23
Interest on and redemption of capital and replacements.....	2.200	35.70
Totals.....	6.162	100.00

Revenue from sundry other sources, amounting to 0.217 cents per passenger,

COMPARATIVE STATEMENT OF EARNINGS OF TORONTO TRANSPORTATION COMMISSION

	1925	1926
Income:		
Passenger earnings:		
Railway and bus transportation.....	\$11,157,893	\$11,362,690
Motor coach transportation.....	132,008	300,811
Income from sundry other sources.....	336,757	386,802
Gross income.....	\$11,626,658	\$12,050,304
Expenditure:		
Cost of electric current, including operation and maintenance of substations..	\$1,108,942	\$1,173,581
Expenses of operation, maintenance, repairs, administration and taxes, including accrued charges.....	6,183,356	6,123,786
Expenses of operation—motor coaches.....	95,271	211,548
Total expenditure.....	\$7,387,570	\$7,508,915
Net income available for fixed charges.....	\$4,239,087	\$4,541,388
Fixed Charges:		
Interest.....	\$2,207,819	\$2,233,494
Reserves on capital account:		
Redemption of debenture debt.....	873,883	1,039,550
Reserve for replacements.....	909,352	998,911
Reserves on operating account:		
Reserve for workmen's compensation and public liability.....	126,968	132,480
Reserve for contingencies.....	50,000	60,000
Reserve for doubtful debts.....	13,000	—
Total fixed charges and reserves.....	\$4,181,024	\$4,464,437
Net income carried to surplus.....	\$58,063	\$76,951

provides the additional amount required to make up the full allowance necessary for replacements and other operating reserves.

Track extensions built in 1926 were 1.561 miles and track removed in 1926 was 0.713 mile. This made a net addition to trackage in Toronto during 1926 of 1.388 miles.

No new large buildings were constructed during the year. The most important work carried out was an alteration of the paint shop at the Hillcrest property so that a modern and economical system of spray painting could be installed. During the year the last of the three storage batteries which the city was obliged to purchase from the Toronto Railway became useless and the Commission disposed of the equipment at scrap values.

The commission owns 972 passenger street cars, 82 electric service cars, 122 buses and coaches, and 39 motor trucks. All of this equipment is maintained in good operating condition and is used in regular service. The reconstruction work on the cars originally acquired from the Toronto Railway was completed during the year. On Dec. 31 1925, there were 98 pay-as-you-enter cars still remaining to be rebuilt. Of these 32 were converted into pay-as-you-leave cars, and 66 were converted for two-car train operation. Nine additional motor coach bodies were built at the Hillcrest Shops in 1926.

The commission continued operation of the street railways in the Township of York and Town of Weston during the year under the special operating agreements which have been referred to in previous reports. These agreements impose no financial obligations on the Commission.

In concluding his statement General Manager Harvey said that the outstanding feature in connection with the operation for the year 1926 was the improvement in traffic, which was most encouraging after the decrease in passenger revenue experienced in 1924 and 1925. The fundamental need of the system was more business. Without increased reve-

COMPARATIVE STATISTICS ON REVENUE PASSENGERS OF TORONTO TRANSPORTATION COMMISSION (City Fare System)

Year	1925	1926
1921*	61,870,213	187,145,261
1922	187,145,261	189,143,145
1923	189,143,145	185,203,698
1924	185,203,698	180,779,925
1925	180,779,925	183,494,076
1926	183,494,076	—
* Four months.		
Month	1925	1926
January.....	16,314,899	15,687,830
February.....	15,065,782	15,067,733
March.....	16,020,330	16,487,826
April.....	14,904,316	15,177,829
May.....	14,922,004	15,224,681
June.....	14,367,817	14,588,118
July.....	13,441,204	13,930,141
August.....	13,643,436	13,976,569
September.....	15,410,594	15,616,925
October.....	15,393,333	15,423,929
November.....	15,133,421	15,504,898
December.....	16,162,789	16,807,597
Totals.....	180,779,925	183,494,076

nue it was impossible to justify further extensions.

It was his opinion that proper co-ordination of the transportation services of any large city to provide adequate and convenient facilities should include regular and reliable service to important centers outside. At the present time several million passengers per year were transported into and out of Toronto by interurban buses. He said the report of the Motor Bus and Truck Committee of the Canadian Electric Railway Association, adopted by the association in 1927, very definitely stated the situation as follows:

It is becoming more and more apparent that the operation of automotive vehicles by the transportation agency of any given area should not be confined strictly to the geographical boundaries of such area. For the street railway system of a city to sit meekly by while others pre-empt all profitable interurban or suburban routes under conditions amounting in practice to perpetual franchises on such routes, spells disaster in the long run to any such system. It involves a constantly increasing loss of local fares to such through-running buses, the creation of a net-work of outside franchises stifling and forbidding the normal growth and development of the local system, the occupancy by others of a field logically belonging to such system and necessary to the economical development of its urban services, and a substantial and pronounced loss of prestige and local favor.

In the report appears this statement:

One of the most difficult conditions your commission has to meet is the constant demand for extension of its rail lines and bus services into localities from which practically no additional revenue can be derived. While your commission recognizes its obligations as a publicly owned utility to provide city-wide service, yet it must have regard for fundamental economic considerations if the present rates of fare are to be maintained. The revenue from the universal fare system has varied only slightly from year to year. The problem of administering the system would be greatly simplified if there were a moderate and consistent yearly increase in revenue.

Book Reviews

History of the Incandescent Lamp

By John W. Howell and Henry Schroeder. The Maqua Company, Schenectady, N. Y. 208 pages.

So that the present generation may have some idea of the design, manufacture and development of the lamp business this history has been written with numerous illustrations to portray the changes in this industry. Something of the romantic era of electric lighting prior to Edison's invention is described so that the reader is in a receptive frame of mind for the introduction of the battery, the ampere and dynamo. The authors in the preface pay tribute to Thomas A. Edison, whose incandescent electric lamp "is the foundation stone upon which the electric light and power industry of today has been built."

Year Book on Commercial Arbitration in the United States, 1927

Prepared by the American Arbitration Association, 342 Madison Avenue, New York City. Published, 1927, by Oxford University Press, American Branch, 35 West 32d Street, New York City. Cloth, 6x9½ in., 1,152 pages. Price \$7.75, post-paid.

This is the first of a series of standard publications on arbitration being prepared under the direction of the Research and Publications Bureau of the American Arbitration Association. The association is a voluntary educational organization, supported by dues and contributions. It serves business through the promotion of arbitration to eliminate the notorious delay, expense and bad after effects of litigation. It acts as an educational body, as an agency to assist other bodies in setting up effective machinery for arbitration and as a practical tribunal where members and friends of arbitration may arbitrate their disputes speedily, justly and at negligible cost.

The body of the book is a complete outline of the existing arbitration arrangements in practically every important industry. Each industry is treated separately with details of the arbitration procedures now in use by its various societies and trade associations. This treatment by industries is followed by a description of the arbitration rules of the U. S. Chamber of Commerce, the International Chamber of Commerce and local chambers all over the United States.

With the aid of name and subject indexes the busy executive can quickly locate those sections relating to arbitration as it exists today in his particular industry or field of work. He will find specific data, names and addresses of organizations, forms and rules of procedure with which he can easily chart a practical course of action. If this book

leads to a more general understanding and acceptance of the economies of commercial arbitration it will help eliminate one of the most glaring wastes in modern industry.

Business Cycles and Business Measurements

By Carl Snyder. New York, N. Y.: The Macmillan Company. 326 pages. Price, \$6.

The striking variations in the fluctuations of trade, from prosperity to crises and depression which we have come to call "business cycles," have had in the United States a greater intensity and, therefore, arouse deeper interest than in perhaps any other country, and many attempts have been made to determine definitely the extent and regularity of this movement. But it is only in recent years, and largely following the great burst of interest aroused during the war, that the material has been available to make such definite measures. In this book the author has sought to put together this wealth of new material and from it derive measures of business from month to month, one of which is a wide composite of a weighted average of 56 independently computed series.

Others have been found in close agreement with this broad combination, and building upon these foundations and the relationships therein established it has been possible to carry back several measures of trade through more than half a century. These measures seem to show that the crises associated with the business cycle reached their intensity in the latter part of the nineteenth century, and has since been of distinctly lessened severity. But the course of these fluctuations is of wide import and it is of deep interest to the business man, especially, to know just what is the current position of industries and trade with reference to that persistent and never-ending growth. These new measures of trade and productive activity are set forth graphically in a series of more than 40 full-page charts.

Wages in the United States, 1914-1926

New York, N. Y.: National Industrial Conference Board. Price \$2.50.

The new volume on wages affords a comprehensive picture of wage conditions and movements in all important occupational fields. Particular attention has been given in the present study to the relation of the wage situation during 1926 to business and industrial conditions during that year. The very pronounced stability and relatively high level of wages during the past three years in the face of declining prices is dealt with as one phase of present conditions especially worthy of study. A novel note is struck by the report in the declaration that the contents of the wage

earner's envelope in many instances no longer represent his sole income. Bonuses based on production, quality of work, on attendance, promptness or long service; profit sharing, employee stock ownership, pensions, health, accident and group insurance and, in some cases, unemployment insurance, co-operative purchasing plans, industrial housing and transportation at less than commercial rates are some of the benefits cited as examples of supplements to wage incomes. This new study of the Conference Board covers wages in agriculture, in the public utilities, in the building trades and on the railroads, as well as wages in 25 important manufacturing industries. The text is well fortified with many tables and charts covering the period 1914 to 1926, inclusive.

Directory of Commercial Testing and College Research Laboratories

Bureau of Standards, Department of Commerce, Washington, D. C. 39 pages. Price, 15 cents.

In recognition of the desirability under present conditions of independent commercial testing service, and in anticipation of the marked increase in the demand for such service in both domestic and export trade, there has been compiled by the National Bureau of Standards a list of laboratories throughout the country that are prepared to test various kinds of commodities, to determine whether or not they can apply to its customer's purchase specifications. In accordance with the law, the National Bureau of Standards makes tests and carries out investigations for other government departments. It is impracticable for the bureau to make tests for private individuals if other laboratories can do the work. To inform interested persons of the location of other laboratories the bureau has compiled a list of 207 commercial testing laboratories throughout the country, together with indications of the types of commodities which they are prepared to test. To accompany the list of commercial testing laboratories there has been compiled a list of 143 colleges which are used not only for the purposes of instruction but also to a considerable extent for research work.

For the purpose of minimizing the disadvantages incident to the use of specifications, the bureau has started a so-called "Certification Plan," in accordance with which there is compiled a list of manufacturers who have expressed their desire to supply material complying with certain selected nationally recognized specifications and willing to certify to the purchasers upon request that the material thus supplied is guaranteed to meet the requirements and tests of specifications. This plan has already been applied to 48 United States government master specifications. Copies of any of the 48 lists of manufacturers, to which additions are being made from time to time, can be obtained upon request.

Personal Items

J. H. Lucas Heads Transportation Section

General superintendent of rolling stock at Milwaukee honored by the Wisconsin Utilities Association

J. H. LUCAS, elected chairman of the transportation section of the Wisconsin Utilities Association at its convention in August, is just complet-



J. H. Lucas

ing his twentieth year in the car building and maintenance industry. He has spent half of that time with the Pullman Company and the last ten years with the Milwaukee Electric Railway & Light Company. At present he is general superintendent of rolling stock at Milwaukee.

When Mr. Lucas, fresh from high school, entered the Pullman company's shops as a template maker apprentice, all cars were made of wood. Among the company's products were many cars for elevated and subway operation, to say nothing about the cars for steam railroad service.

Among important developments at Milwaukee since Mr. Lucas has been there are the placing in service of the three-truck, articulated train and the double-truck one-man or two-man safety car which succeeded the single-truck safety cars of 1917 and 1918. The larger car, about 45 ft. in length, designed and built in Milwaukee, was put in service in March, 1920. About five years ago a five-year program of rehabilitation of interurban equipment was begun by the Milwaukee Company and since 1919 the rolling stock department has been called upon to meet the problems incident to the operation of buses and those that have arisen in connection with the operation of garages.

As superintendent of rolling stock, Mr. Lucas has developed a very complete system of inspection service and has charge of a shop layout which probably has more modern mechanical equipment and labor-saving devices than any other shops of similar size in the country. His department looks after 800

local cars, 100 interurban cars, 150 buses and 400 other vehicles including work cars, trucks and automobiles.

The outlook of Mr. Lucas with respect to the present and the future design of both cars and buses was perhaps reflected best in the paper which he presented before the transportation section of the Wisconsin Association at the recent meeting in Milwaukee and reprinted in *ELECTRIC RAILWAY JOURNAL* for Sept. 3, page 391.

Changes Made on Indiana Property

The Indiana Service Corporation, Fort Wayne, Ind., announces the appointment of M. M. Herrell as traffic agent with headquarters at Longansport. Mr. Herrell will represent the traffic department in all matters pertaining to freight and passenger business in Peru, Logansport, Delphi, LaFayette and intermediate towns. He was passenger and freight agent at Wabash for several years. This appointment was made necessary by the increase of business in the towns mentioned and by the desire to have a thoroughly trained traffic man available for patrons at all times.

Marvin Erb, passenger agent at Peru, has been promoted to passenger and freight agent at Wabash to take Mr. Herrell's place.

W. F. See, who was Mr. Erb's assistant at Peru, has been appointed passenger agent at Peru.

Market Street Men Receive Promotions

Five appointments of general interest have been announced by Samuel Kahn, executive vice-president of the Market Street Railway, San Francisco, Cal.

J. W. Delaney has been named superintendent of equipment and his assistant will be C. D. Miller. Both of these men received training in the company's shops under J. M. Yount, who has been elected to the office of vice-president in charge of equipment and maintenance, a new position created to provide technical administration of shops, tracks, cables, overhead lines and substations. Mr. Yount has served as superintendent of equipment of the company since 1910. Mr. Delaney has been assistant to Mr. Yount since 1924 and Mr. Miller has served as inspector of equipment since 1919.

E. H. Lincoln is the new superintendent of the Geneva division. He has occupied a similar post at the McAllister division since 1924. The post vacated by Mr. Lincoln will be filled by P. O'Marie, who for six years has been superintendent of ferry terminals.

T. B. Gavin Auditor at Dayton

Man of wide experience in accounting practices named to interurban recently reorganized

T. B. GAVIN is auditing the books and accounts of the recently re-habilitated Cincinnati, Hamilton & Dayton Railway, Dayton, to which he brings a somewhat varied experience in general accounting work. It was while representing Arthur Young & Company on an audit of the accounts of the Dayton property that he attracted the



T. B. Gavin

attention of the officials of that line who later appointed him auditor.

In his early youth at Chicago Mr. Gavin was affiliated with the Stock Yards Company and the Chicago Junction Railway, the former handling all the livestock that went to the Chicago market and the latter transporting the stock in its last interline movement. The accounting for this entire group of interests was handled in one office and was directed by the famous railroad accountant, Charles C. Chace. From the lowly post of voucher clerk in this organization of more than 100 persons to that of assistant to the comptroller he advanced all in the space of four years. He was also appointed auditor of the Electric Light & Power Company, which was a member of this group of interests.

His advancement was accelerated by his night school attendance and graduation from Business College, and his attendance at the LaSalle Extension University, where he took up higher accounting and business management. The knowledge thus gained was soon reflected in his work, and when the war came he was placed in charge of the task of preparing the consolidated income tax return of the allied interests. About that time the railroads were taken over by the government and Mr. Gavin was given the job of directing the accounting of corporate interests of the Chicago Junction Railway and also those of the Chicago River & Indiana Railway. After the war he was appointed income tax auditor for the Revenue Department but preferred to enter the public accounting field.

Later he entered the manufacturing field as auditor of the Illinois Tool Works, Chicago, maker of high-speed tools for the automotive industry.

Nor does this enumerate the many contacts which Mr. Gavin made before his signing with the Dayton railway property. He became general manager of a large manufacturing house and still later installed a general accounting

system in Mandel Brothers, accomplishing this work with the co-operation of the then comptroller, John F. Ruffner, now assistant to the president of the "Fair," Chicago, America's foremost exponent of the retail system of inventory and authority on department store accounting.

Mr. Gavin was born in Ottawa, Ill., where he received his early education.

Department Heads in Oakland Are Made Vice-Presidents

Careers are reviewed of men recently advanced
to executive posts by Key System Transit—
Each man a specialist of wide experience

FURTHER reorganization of the forces of the Key System Transit Company, Oakland, Cal., was made recently at a special meeting of the board of directors. Four departments were created, each headed by a vice-president, to constitute, with Alfred J. Lundberg, president, the operating force of the company.

The new vice-presidents are: James P. Potter, in charge of operation; H. P. Bell, in charge of engineering; C. C. Vargas, in charge of finance; and Paul Goldsmith, in charge of public relations. Each of these four men formerly bore the title of manager of his department, but they were elevated to

president. Mr. Vargas, under the new arrangement, will have supervision of all financial matters, including auditing, accounting and purchasing. He entered the service of the Key System in July, 1912, as payroll extension clerk in the auditing department, at a salary of \$35 a month. After occupying various positions, he resigned as chief clerk in that department in July, 1918, to become auditor with the capital issues committee in Washington, D. C. When this committee dissolved in December, 1918, Mr. Vargas was made disbursing officer for the War Risk Insurance. There he remained until July, 1920. He then returned to California as auditor for the



Paul Goldsmith



James P. Potter



C. C. Vargas

the rank of vice-president in accordance with the new president's plan of co-ordination.

C. O. G. Miller remains as chairman of the board of directors and Lester S. Ready, recently resigned as president, is vice-chairman.

J. P. Potter, for many years superintendent of transportation, is now head of the operating department. He will have charge of ferry, bus, car and train operation. He is one of the oldest officials in point of service in the Key System and is one of the best known railway executives in the country.

C. C. Vargas, head of the financial department, is one of the youngest Key executives. He was formerly assistant to C. O. G. Miller when the latter was

Mercantile Trust Company. In January, 1922, he reentered the service of the Key System as comptroller, being made assistant to the president on March 16, 1925, in addition to retaining his duties as comptroller. Mr. Vargas was born on Dec. 25, 1892, in Lemore, Kings County, Cal. He attended grammar and high schools in Nevada. Returning to California, he entered the University of California night school and took courses in accounting and in finance.

Paul Goldsmith, manager of public relations and advertising, is a former Oakland newspaper man. Since he has been in office there has been an era of better feeling between the newspapers and the railway than existed in the past.

FRANK BENNETT, senior supervising inspector of transit for the Board of Transportation of New York, has retired on a pension under the retirement plan in effect for city employees. His associates in the city service honored him recently at a dinner attended by more than 100 of his fellow workers. Mr. Bennett, was the first dispatcher and trainmaster in charge of the electric operation of the southern division of the old Brooklyn Rapid Transit system. He had taken up railroading when he left City College and had been brakeman, towerman and dispatcher on the Delaware, Lackawanna & Western, the Santa Fe and the Union Pacific before he joined the company in Brooklyn. He entered the service of the original Public Service Commission in 1907 as a transit inspector.

OBITUARY

Hugh McCloskey

Notable among the achievements of Hugh McCloskey, beloved citizen of New Orleans, La., who died recently, was the rehabilitation of the New Orleans Railway & Light Company. When in the early years of the present century the transportation system in that city had reached its low point he was urged to come to the rescue, accept its presidency and put it on its feet.

Mr. McCloskey's active connection with the affairs of the New Orleans Railway & Light Company and the American Cities Company, by which the New Orleans Railway & Light Company was controlled, dates from March, 1908, when he was elected chairman of the board of directors of the latter company. Later he was elected president and the position of chairman of the board was abolished. Following the completion of the construction program which he laid down for the company in New Orleans, Mr. McCloskey relinquished the office of president and again became chairman of the board and in addition president of the American Cities Company. He relinquished these posts in 1915.

Among the improvement projects effected during his administration was the placing of the Carrollton Avenue and City Park Driveway tracks in neutral ground so as not to interfere with the street paving, and the authorization of the construction of a new line out to St. James Avenue to Milneburg. Under his administration Spanish Fort was purchased and converted into a pleasure resort, the railway being built to that point. The company stood half the expenses with the New Orleans Land Company in building a driveway to Spanish Fort.

In the midst of his utility activity is another story of his financial, business and social interests. Some years ago Mr. McCloskey received the New Orleans *Picayune's* loving cup for his public-spirited efforts in giving the city its wharves and sheds.

Manufactures and the Markets

Exhibit Committee Asks Cooperation in Bus Exhibit Placing

Because expense may be incurred to bus and truck exhibitors if they do not deliver their exhibits at the Cleveland Auditorium in time, a special bulletin was mailed on Sept. 3 by Fred C. J. Dell, director of exhibits, urging that all parties concerned adhere strictly to the appended schedule:

in inside space but would be outside of the building and under responsible watchman service.

Exhibitors are requested to hang from each steering wheel a tag showing the space number where the vehicle is to be placed. This will save moving around. They are also requested to advise Norris Brothers Company, 2138 Davenport Avenue, Cleveland, Ohio, whether the bus or truck will arrive

SCHEDULE COVERING ARRIVAL OF ALL AUTOMOTIVE VEHICLES TO BE SHOWN AT THE 46th ANNUAL CONVENTION OF THE AMERICAN ELECTRIC RAILWAY ASSOCIATION

Exhibitor's Firm Name	Space Numbers	Bus-es, Chassis and Trucks to Arrive
American Car & Foundry Motors Company....	620 to 625, inc.	Sept. 29 bet. 9 a.m. and 12 noon
Baker-Raulang.....	667 and 668	Sept. 28 bet. 9 a.m. and 12 noon
Bender Body Company.....	669-670-671-672-673	Sept. 28 bet. 9 a.m. and 12 noon
Commercial Shearing & Stamping Company.....	664	Sept. 29 bet. 1 p.m. and 5 p.m.
Fitsajohn Manufacturing Company.....	406 and 1/2 of 405	Sept. 28 bet. 1 p.m. and 5 p.m.
Fremont Metal Body Company.....	452 and 454	Sept. 28 bet. 9 a.m. and 12 noon
Graham Brothers.....	665 and 666	Sept. 28 bet. 1 p.m. and 5 p.m.
Gramm Motors.....	663	Sept. 29 bet. 1 p.m. and 5 p.m.
International Harvester Company.....	422-423-424	Sept. 28 bet. 1 p.m. and 5 p.m.
International Motor Company.....	448	Sept. 29 bet. 9 a.m. and 12 noon
The Lang Body Company.....	449	Sept. 28 bet. 1 p.m. and 5 p.m.
Mack-International Motor Truck Company....	443-445-447	Sept. 29 bet. 9 a.m. and 12 noon
Mack Motor Truck Company.....	442-444-446	Sept. 29 bet. 9 a.m. and 12 noon
Mack Trucks, Inc.....	441	Sept. 29 bet. 9 a.m. and 12 noon
Murray Corporation of America.....	425-426-427-428	Sept. 28 bet. 9 a.m. and 12 noon
Reo Motor Car Company.....	404 and 1/2 of 405	Sept. 28 bet. 1 p.m. and 5 p.m.
The Six Wheel Company.....	600-601	Sept. 29 bet. 1 p.m. and 5 p.m.
Saf-T-Cab Corporation.....	453 and 455	Sept. 28 bet. 9 a.m. and 12 noon
Studebaker Corporation of America.....	473-474-475	Sept. 28 bet. 1 p.m. and 5 p.m.
Versare Corporation.....	476	Sept. 28 bet. 1 p.m. and 5 p.m.
Twin Coach Company.....	468-469-470-471-472	Sept. 29 bet. 1 p.m. and 5 p.m.
Walter Motor Truck Company.....	604-605	Sept. 28 bet. 9 a.m. and 12 noon
The White Company.....	657 to 662, inc.	Sept. 29 bet. 1 p.m. and 5 p.m.
C. H. Will Motors.....	495-496-497	Sept. 29 bet. 1 p.m. and 5 p.m.
Yellow Truck & Coach Manufacturing Company.	414 to 421, inc.	Sept. 29 bet. 9 a.m. and 12 noon

"It is not considered necessary," Mr. Dell said, "to dwell upon the importance of this schedule being observed. If your equipment does not arrive when scheduled, inconvenience is caused other exhibitors and it may be necessary for you to pay an extra charge in order to get your vehicles placed, because of the possible necessity of rehandling other exhibits which have been set up.

"Buses or trucks arriving in Cleveland under their own power, can be delivered by owners' drivers direct to exhibition space and placed. Buses arriving by freight, where necessary to unload from cars, will be handled by Norris Bros. Company (official draymen), at the same rate as prevails for exhibit materials."

Companies driving buses over the road and wishing to have them washed, can instruct drivers to take them direct to the Auditorium Building Operating Company, East Sixth Street and St. Clair Avenue, Cleveland, Ohio. The schedule of rates including exterior wash, chamois body polish, and interior sweeping and dusting is single-deck buses, \$3; double-deck buses, \$4. Any single-deck bus that must be stored until the exhibitor has an opportunity of placing it in his exhibition space, will be charged for by the Auditorium Building Operating Company at a flat rate of \$2 per night, or for 24 hours for such storage. The storage charge for double-deck buses would be \$1 per night or for 24 hours. However, the double-deck buses would not be stored

by rail or under its own power, also as to the exact date it will arrive in Cleveland, so the company may plan its other trucking accordingly.

Attention is once again called to the clause in the space contract reading: "The tanks of all motor vehicles must be drained and all vehicles made inoperative immediately after being placed in exhibition space." Drip pans or oil proof canvas should be provided by the exhibitor for the protection of floors. No change of tires will be permitted between 12 noon, Oct. 1, and 12 noon Oct. 7.

Two Objects Cannot Occupy the Same Place at the Same Time

If you, Mr. Truck and Bus Exhibitor, will bear this law in mind there will be no confusion or regrets at the big

CLEVELAND SHOW Oct. 3-8

Read Freddie Dell's schedule for the arrival of Automotive Exhibits

You Can't Get By When The Road's Obstructed

Double Trackings In Detroit To Begin in Thirty Days

A mile of double track, estimated at \$140,000, will be laid on the Fourteenth Avenue and Trumbull Avenue car lines within 60 days, according to an announcement by Del A. Smith, general manager of the Department of Street Railways in Detroit. The work will begin within 30 days and is to be completed on Oct. 15.

Extensions will involve 1 mile of double track on Livernois Avenue from Davison to Fenkell Avenues, linking the present terminus of the Fourteenth Avenue line at Davison and Livernois Avenues with the present Trumbull Avenue line between Fenkell and Six Mile Road on Livernois Avenue. The Trumbull Avenue line will be extended 1 mile west from Livernois on Fenkell Avenue to Wyoming Avenue.

Work on Boston Subway Extension Continues

Work is about to start on the fourth section of the Dorchester rapid transit system in Boston, a \$10,000,000 project which was begun three years ago. There were eight bids for the work, ranging from \$401,565 to \$537,475, the lowest bid being from the C. & R. Construction Company, which also received the contract for the third section, now almost completed. The fourth section runs from Peabody Square to Shawmut Junction, and includes the Ashmont station. It will take about 300 days for its construction.

New Season Opens for Metal Sellers

Not much activity was expected in the non-ferrous metal market in the week ending Sept. 6, what with the Labor Day holiday and all, so potential sellers were not particularly disappointed at the disinterestedness of consumers.

Copper prices are again practically unchanged after another week, with only a small volume of trading. Most producers continue to offer the metal at 13½ cents delivered in the East and 13⅝ cents in the Middle West, with only an occasional sale of a small lot. On the other hand, custom smelters are sellers at as low as 13¼ cents, and manage to get rid of enough to prevent their cutting prices further. The foreign market also continues quiet, with the c.i.f. price unchanged at 13½ cents.

The lead market continues to decline and consumers have displayed little or no interest. One large seller is almost out of the market, but, notwithstanding this, prices declined perceptibly. On Sept. 6 the American Smelting & Refining Company reduced its contract price from 6.50 cents to 6.40 cents New York.

Tin has remained steady, but there has been little or no demand by consumers, sales being mainly to dealers.



Another Canadian Railway Specifies "Peacock" Staffless Brakes . . .

Reg. U. S. Pat. Off.

TWENTY one-man, two-man city type units, just placed in service by the Ottawa Electric Railway, Ottawa, Ont., and built by the Ottawa Car Manufacturing Co., are equipped with "Peacock" Staffless Brakes.

The cars have a seating capacity of 47 passengers, are 45 ft. long and are the last word in modern car construction.

Let us tell you why this company and nearly all the purchasers of modern cars in the United States and Canada specify "Peacock" Staffless Brakes. A note on your letterhead will bring this interesting story.



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What is a great business to do? Retire with honor? Or revive with glory? Here is the story of one manufacturer who chose the latter course.

Life in the Balance

The Armistice, shortly followed by the "5-5-3 agreement" on naval limitations, cut this manufacturer's market to a critical fraction of his plant capacity. His corporate life hung in the balance. With the vanishing of the old market, this producer resourcefully turned to a comparatively new, and at that time little used secondary product.

A research bureau was established to determine the adaptability of the new product to different industries. As sales opportunities unfolded, salesmen were trained as specialists in the specific fields. The selling was pitched on the high plane of genuine service to the buyer. There was no promiscuous selling—no knocking at doors in hope that prospects would be found within.

Industrial Advertising, conceived to build industrial recognition for this new product and its salesmen, was

planned and scheduled with the same shrewd regard for specialization. The counsel of an experienced advertising agent was obtained. The Industrial Advertising, geared to the self-interests of the different classes of industrial buyers, was persistently published in McGraw-Hill Publications.

A Sensational Recovery

Aided by the power and force of Industrial Advertising, this producer "cheated the mourners" by developing a volume for the new product far in excess of the highest peak of any previous prosperity. And this achievement took place while the general business trend in collateral industries was in a declining direction.

If Industrial Advertising, co-ordinated with an Industrial Marketing plan, can rehabilitate a declining business, who can estimate its power and force when aided by favorable circumstances?

This sensational recovery was not the result of some miraculous chance. It was the outcome of just such common-sense marketing methods as are formulated in the McGraw-Hill book, "Industrial Marketing at Work." If you are an executive interested in the national industrial market, a McGraw-Hill representative will leave a copy of this book with you or your advertising agent. Notify the nearest McGraw-Hill office.



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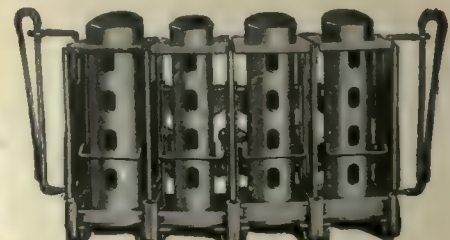
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Johnson Electric Fare Boxes and overhead registers make possible the instantaneous registering and counting of every fare. Revenues are increased 1 1/4 to 5% and the efficiency of one-man operation is materially increased. Over 4000 already in use.

When more than two coins are used as fare, the Type D Johnson Fare Box is the best manually operated registration system. Over 50,000 in use.

Johnson Change-Makers are designed to function with odd fare and metal tickets selling at fractional rates. It is possible to use each barrel separately or in groups to meet local conditions. Each barrel can be adjusted to eject from one to five coins or one to six tickets.



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Kaldla is a small clump of bushes on the African veld.

Kaffir boys start up two or three springbok and manoeuvre so as to drive them into those tough bushes, in which their horns get tangled and they are easily caught.

You see, the bok was not made for bushwhacking, so he comes to grief when he's off his beat.

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Revere, Mass., J. F. Drummey, 75 Pleasant Street.
Los Angeles, Electrical Engineering Sales Co., 502 Delta Building.
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Meters
"Topesald" Lamps
Bus Lighting Equipment
Cowdrey Automotive Brake
Testing Machine

The DIFFERENTIAL CAR



**Standard on
60 Railways for**

Track Maintenance
Track Construction
Ash Disposal
Coal Hauling
Concrete Materials
Waste Handling
Excavated Materials
Hauling Cross Ties
Snow Disposal

Use These Labor Savers

Differential Crane Car
Clark Concrete Breaker
Differential 3-way Auto Truck Body
Differential Car Wheel Truck and Tractor

THE DIFFERENTIAL STEEL CAR CO., Findlay, O.

FARE BOXES for BUSES

Let us tell you of this especially designed box for this class of service.



The Cleveland Fare Box Co.
4900 Lexington Ave., Cleveland, O.
Canadian Cleveland Fare Box Co., Ltd.
Preston, Ontario

COIN COUNTING And Sorting Machines CHANGES CARRIERS Tokens

SEARCHLIGHT SECTION

USED EQUIPMENT & NEW—BUSINESS OPPORTUNITIES

UNDISPLAYED—RATE PER WORD:

Positions Wanted, 4 cents a word, minimum 15 cents an insertion, payable in advance.
Positions Vacant and all other classifications, 8 cents a word, minimum charge \$2.00.
Proposals, 40 cents a line an insertion.

INFORMATION:

Box Numbers in care of any of our offices count 10 words additional in undisplayed ads.
Discount of 10% if one payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED—RATE PER LINE:

1 to 3 inches \$1.50 an inch
4 to 7 inches \$3.00 an inch
8 to 14 inches \$4.00 an inch
Rates for larger spaces, or yearly rates, distributed.
An advertising inch is measured vertically for one column, 3 columns—30 inches—to a page.

POSITIONS WANTED

EQUIPMENT superintendent, experienced and efficient in the maintenance of cars and busses, good organizer, assuring reliable equipment with low cost. Age 45. References past and present employers, correspondence solicited. PW-35, Electric Railway Journal, 7 South Dearborn St., Chicago, Ill.

SUPERINTENDENT transportation. 20 years' experience city and interurban properties; also co-ordination rail and bus. Recognized ability, highly commended record of achievements. Successful dealing with labor, public. Increasing revenue. Decreasing operating costs. Fully capable of getting results. Fine references. PW-34, Electric Railway Journal, Guardian Bldg., Cleveland, O.

WOULD like to correspond with any company needing a high-grade official in any capacity, in city or interurban railways. Can manage any or all departments in the most efficient manner. PW-33, Electric Railway Journal, Guardian Bldg., Cleveland, O.

YOUNG man desires position in power saving department of electric railway. Four years' experience with economy meters including preliminary work organization, clerical statistical maintenance and motormen instruction work. Good references. PW-37, Electric Railway Journal, 7 South Dearborn Street, Chicago, Ill.

Railway Substation Equipment

600 Volts D. C., 3 Phase, 25 Cycle, 33,000 volts A. C.

- 10—300 kw. Westinghouse Rotary Converters, 600 volts D.C., 500 amps. D.C., 500 r.p.m.: 3 phase, 25 cycle, 390 volts A.C. with Westinghouse Type C Induction Motors for starting, 3 phase, 25 cycle, 390 volts. Each complete with:
 - 3—100 kva. Westinghouse single phase, oil cooled Transformers, 25 cycle, 33,000 volts primary, 390 volts secondary.
- Elaborate marble alternating current starting and control panels, high tension disconnect switches, lightning arresters, choke coils, etc., also marble direct current control and feeder panels with instruments, circuit breakers, switches, etc.
All on original foundation in first-class operative condition and complete as in operation.

Write or wire for details and prices.

The National Power Machinery Company

1927 Scranton Road, Cleveland, Ohio

"Opportunity" Advertising:

Think
"SEARCHLIGHT"
First!

FOR SALE

JOHNSON FARE BOXES

47—D-M-2, good operating condition: low price. Changed method of collection, reason for selling.

GRAND RAPIDS RAILROAD CO.
42 Ionia Ave., Grand Rapids, Mich.

FOR SALE

15 BIRNEY SAFETY CARS

Brill Built

West, 508 or G. E. 264 Motors
Cars Complete—Low Price—Fine Condition
ELECTRIC EQUIPMENT CO.
Commonwealth Bldg., Philadelphia, Pa.

FOR SALE

TANDEM ROLLER

1—Springfield-Buffalo 5-ton, for \$2,000. Cost \$3,100 new. Has had very little use and is in first-class condition.

Trenton & Mercer Co. Traction Corp.
Broad St. Bank Bldg., 143-149 E. State St.,
Trenton, N. J.

If there is anything you want—

or something you don't want that *other* readers of this paper can supply —
or use—advertise in the

SEARCHLIGHT SECTION

Somebody is always looking for something to meet certain business needs. Some men in charge of plant operations may be in the market for good used equipment—others may have just what they want, to sell. Some may require a man of unusual quali-

fications for a particular position—that man may be another reader of this paper!

Put the Searchlight Section to work for you under any of the following classifications—to fill your business needs.

Agencies Wanted
Agents Wanted
Auction Notices
Buildings For Sale
Business Opportunities
Civil Service Opportunities
Contracts To Be Let

Contracts Wanted
Educational Courses
Employment Agencies
Exchanges
For Rent Items
Franchises
Industrial Sites

Miscellaneous Wants
New Industries Wanted
Partners Wanted
Patents For Sale
Patent Attorneys
Plants For Sale
Positions Vacant

Positions Wanted
Property For Sale
Receivers' Sales
Representatives Wanted
Salesmen Wanted
Work Wanted
Etc., Etc., Etc.

WHAT AND WHERE TO BUY

Equipment, Apparatus and Supplies Used by the Electric Railway Industry
with Names of Manufacturers and Distributors Advertising in this Issue

Advertising, Street Car
Jollier, Inc., Barron G.
Air Brakes
Westinghouse Air Brake Co.
Anchors, Guy
Elec. Service Supplies Co.
Ohio Brass Co.
Westinghouse E. & M. Co.
Armature Shop Tools
Columbia Machine Works
Elec. Service Supplies Co.
Automatic Return Switch
Stands
Ramapo Ajax Corp.
Automatic Safety Switch
Stands
Ramapo Ajax Corp.
Axles
Bemis Car Truck Co.
Bethlehem Steel Co.
Brill Co., The J. G.
Carnegie Steel Co.
Cincinnati Car Co.
Illinois Steel Co.
St. Louis Car Co.
Standard Steel Works
Westinghouse E. & M. Co.
Babbitt Metal
National Bearing Metals
Corp. (More Jones Brass
& Metal Co. Div.)
Babbiting Devices
Columbia Machine Works
& M. I. Co.
Barges, Steel
American Bridge Co.
Badges and Buttons
Elec. Service Supplies Co.
International Register Co.
Batteries, Dry
Nichols-Lintern Co.
Bearings and Bearing Metals
Bemis Car Truck Co.
Brill Co., The J. G.
Cincinnati Car Co.
Columbia Machine Works &
M. I. Co.
General Electric Co.
National Bearing Metals
Corp.
(More-Jones Brass & Metal
Co. (Div.))
St. Louis Car Co.
Westinghouse E. & M. Co.
Bearings, Center and Roller
Side
Cincinnati Car Co.
Columbia Machine Works
Stucki Co., A.
Bells and Buzzers
Consolidated Car Heating
Co.
Bells and Gongs
Brill Co., The J. G.
Cincinnati Car Co.
Columbia Machine Works &
M. I. Co.
Elec. Service Supplies Co.
St. Louis Car Co.
Benders, Rail
Railway Trackwork Co.
Rodies, Bus
Brill Co., The J. G.
St. Louis Car Co.
Body Material, Haskellite and
Plymett
Haskellite Mfg. Corp.
Rollers
Babcock & Wilcox Co.
Bolts & Nuts, Track
Illinois Steel Co.
Bond Testers
American Steel & Wire Co.
Elec. Service Supplies Co.
Bonding Apparatus
American Steel & Wire Co.
Elec. Service Supplies Co.
Ohio Brass Co.
Railway Trackwork Co.
Una Welding & Bonding Co.
Bonds, Rail
American Steel & Wire Co.
Elec. Service Supplies Co.
General Electric Co.
Ohio Brass Co.
Railway Trackwork Co.
Una Welding & Bonding Co.
Westinghouse E. & M. Co.
Brackets and Cross Arms
(See also Poles, Ties,
Posts, etc.)
American Bridge Co.
Bates Expanded Steel
Truss Co.
Columbia Machine Works
Elec. Ry. Equipment Co.
Elec. Service Supplies Co.
Hubbard & Co.
Ohio Brass Co.
Brake Adjusters
Brill Co., The J. G.
Cincinnati Car Co.
National Ry. Appliance Co.
Westinghouse Tr. Br. Co.
Brake Shoes
American Brake Shoe &
Foundry Co.
Bemis Car Truck Co.
Brill Co., The J. G.
St. Louis Car Co.
Brake Testers
National Ry. Appliance Co.

Brakes, Brake Systems and
Brake Parts
Bemis Car Truck Co.
Brill Co., The J. G.
Cincinnati Car Co.
Columbia Machine Works
& M. I. Co.
General Electric Co.
National Brake Co.
Safety Car Devices Co.
St. Louis Car Co.
Westinghouse Tr. Br. Co.
Brakes, Magnetic Rail
Cincinnati Car Co.
Bridges, Steel
American Bridge Co.
Brushes, Carbon
General Electric Co.
Jeandron, W. J.
LeCarbone Co.
Morganite Brush Co.
Westinghouse E. & M. Co.
Brushes, Graphite
Morganite Brush Co.
Brushholders
Columbia Machine Works
Buildings, Steel
American Bridge Co.
Bulkheads
Haskellite Mfg. Corp.
Bunkers, Coal
American Bridge Co.
Bus Lighting
National Ry. Appliance Co.
Bushings, Case Hardened
and Manganese
Bemis Car Truck Co.
Brill Co., The J. G.
Cincinnati Car Co.
Columbia Machine Works
St. Louis Car Co.
Cables (See Wires and
Cables)
Cambric Tapes, Yellow and
Black Varnish
Irvington Varnish & Ins.
Co.
Carbon Brushes (See
Brushes, Carbon)
Car Lighting Fixtures
Elec. Service Supplies Co.
Car Panel Safety Switches
Consolidated Car Heating
Co.
Westinghouse E. & M. Co.
Car Steps, Safety
Cincinnati Car Co.
Car Wheels, Rolled Steel
Bethlehem Steel Co.
Cars, Dump
Brill Co., The J. G.
Differential Steel Car Co.
St. Louis Car Co.
Cars, Gas-Electric
Brill Co., The J. G.
General Electric Co.
Westinghouse E. & M. Co.
Cars, Gas, Rail
Brill Co., The J. G.
St. Louis Car Co.
Cars, Passenger, Freight,
Express, etc.
American Car Co.
Brill Co., The J. G.
Cincinnati Car Co.
Kuhlman Car Co., G. C.
St. Louis Car Co.
Wason Mfg. Co.
Cars, Second Hand
Electric Equipment Co.
Cars, Self-Propelled
Brill Co., The J. G.
General Electric Co.
Castings, Brass Composition
or Copper
Cincinnati Car Co.
Columbia Machine Works &
M. I. Co.
National Bearing Metals
Corp.
(More-Jones Brass & Metal
Co. (Div.))
Castings, Gray Iron and
Steel
American Bridge Co.
Bemis Car Truck Co.
Columbia Machine Works &
M. I. Co.
St. Louis Car Co.
Standard Steel Works
Castings, Malleable & Brass
Bemis Car Truck Co.
Columbia Machine Works &
M. I. Co.
St. Louis Car Co.
Catchers and Retrievers,
Trolley
Elec. Service Supplies Co.
Ohio Brass Co.
Wood Co., Chas. N.
Catenary Construction
Archbold-Brady Co.
Ceiling Car
Haskellite Mfg. Corp.

Ceilings, Plywood, Panels
Haskellite Mfg. Corp.
Change Carriers
Cleveland Fare Box Co.
Electric Service Supplies Co.
Change Trays
Cincinnati Car Co.
Circuit-Breakers
General Electric Co.
Westinghouse E. & M. Co.
Clamps and Connectors for
Wires and Cables
Columbia Machine Works
Elec. Ry. Equipment Co.
Elec. Service Supplies Co.
General Electric Co.
Hubbard & Co.
Westinghouse E. & M. Co.
Cleaners and Scrapers Track
(See also Snow-Flows,
Sweepers and Brooms)
Brill Co., The J. G.
Cincinnati Car Co.
Ohio Brass Co.
St. Louis Car Co.
Clusters and Sockets
General Electric Co.
Coil Banding and Winding
Machines
Columbia Machine Works &
M. I. Co.
Elec. Service Supplies Co.
Westinghouse E. & M. Co.
Coils, Armature and Field
Columbia Machine Works &
M. I. Co.
General Electric Co.
Westinghouse E. & M. Co.
Coils, Choke and Kicking
Elec. Service Supplies Co.
General Electric Co.
Westinghouse E. & M. Co.
Coin Changers
Johnson Fare Box Co.
Coin Counting Machines
Cleveland Fare Box Co.
International Register Co.
Johnson Fare Box Co.
Coin Sorting Machines
Cleveland Fare Box Co.
Johnson Fare Box Co.
Coin Wrappers
Cleveland Fare Box Co.
Commutator Slotters
Columbia Machine Works
Elec. Service Supplies Co.
General Electric Co.
Westinghouse E. & M. Co.
Wood, Co., Chas. N.
Commutator Truing Devices
General Electric Co.
Commutators or Parts
Cameron Electrical Mfg. Co.
Columbia Machine Works &
M. I. Co.
General Electric Co.
Westinghouse E. & M. Co.
Compressors, Air
General Electric Co.
Westinghouse Tr. Br. Co.
Condensers
General Electric Co.
Westinghouse E. & M. Co.
Condensor Papers
Irvington Varnish & Ins.
Co.
Connectors, Solderless
Westinghouse E. & M. Co.
Connectors, Trailer Car
Columbia Machine Works
Consolidated Car Heating
Co.
Elec. Service Supplies Co.
Ohio Brass Co.
Controllers or Parts
Columbia Machine Works &
M. I. Co.
General Electric Co.
Controller Regulators
Elec. Service Supplies Co.
Controlling Systems
General Electric Co.
Westinghouse E. & M. Co.
Converters, Rotary
General Electric Co.
Westinghouse E. & M. Co.
Conveying & Hoisting
Machinery
American Bridge Co.
Copper Wire
American Brass Co.
American Steel & Wire Co.
Anaconda Copper Mining
Co.
Copper Wire Instruments,
Measuring, Testing and
Recording
American Brass Co.
Anaconda Copper Mining Co.
Cord, Bell, Trolley, Register
American Steel & Wire Co.
Brill Co., The J. G.
Elec. Service Supplies Co.
International Register Co.

Roebbling's Sons Co., John A.
St. Louis Car Co.
Samson Cordage Works
Cord Connectors and
Couplers
Elec. Service Supplies Co.
Samson Cordage Works
Wood Co., Chas. N.
Couplers, Car
Brill Co., The J. G.
Cincinnati Car Co.
St. Louis Car Co.
Ohio Brass Co.
Westinghouse Traction
Brake Co.
Cowl Ventilators
Nichols-Lintern Co.
Cranes, Hoists & Lifts
Electric Service Supplies Co.
Cross Arms (See Brackets)
Crossing Foundations
International Steel Tie Co.
Crossings
Ramapo Ajax Corp.
Wm. Wharton, Jr. & Co.
Crossings, Frogs & Switches
Ramapo Ajax Corp.
Wm. Wharton, Jr. & Co.
Crossings, Manganese
Bethlehem Steel Co.
Ramapo Ajax Corp.
Wm. Wharton, Jr. & Co.
Crossings, Track (See Track
Special Work)
Crossing, Trolley
Ohio Brass Co.
Westinghouse E. & M. Co.
Curtains & Curtain Fixtures
Brill Co., The J. G.
St. Louis Car Co.
Dealer's Machinery & Second
Hand Equipment
Electric Equipment Co.
Grand Rapids R.R. Co.
National Power & Mch.
Co.
Trenton & Mercer Co. Traction
Corp.
Derailing Devices (See also
Track Work)
Derailing Switches
Ramapo Ajax Corp.
Destination Signs
Columbia Machine Works &
M. I. Co.
Elec. Service Supplies Co.
Detective Service
Wish-Servic, P. Edward
Door Operating Devices
Brill Co., The J. G.
Cincinnati Car Co.
Consolidated Car Heating Co.
National Pneumatic Co.
Safety Car Devices Co.
Doors & Door Fixtures
Brill Co., The J. G.
Cincinnati Car Co.
General Electric Co.
Hale-Kilburn Co.
St. Louis Car Co.
Doors, Folding Vestibule
National Pneumatic Co.
Safety Car Devices Co.
Drills, Track
American Steel & Wire Co.
Electric Service Supplies Co.
Ohio Brass Co.
Dryers, Sand
Electric Service Supplies Co.
Ohio Brass Co.
Westinghouse E. & M. Co.
Ears
Columbia Machine Works
& M. I. Co.
Electric Service Supplies Co.
Ohio Brass Co.
Westinghouse E. & M. Co.
Electric Grinders
Railway Trackwork Co.
Electric Transmission
Towers
American Bridge Co.
Electrical Wires and Cables
Amer. Electrical Works
American Steel & Wire Co.
John A. Roebbling's Sons Co.
Electrodes, Carbon
Railway Trackwork Co.
Una Welding & Bonding Co.
Electrodes, Steel
Railway Trackwork Co.
Una Welding & Bonding Co.
Engineers, Consulting, Con-
tracting and Operating
Archbold-Brady Co.
Reeler, John A.
Bibbins, J. Rowland
Byllesby Co., H. M.
Day & Zimmermann, Inc.
Falle & Co., E. H.
Ford, Bacon & Davis
Hemphill & Wells

Holst, Engelhardt W.
Jackson, Walter
Kelker & DeLeuw
Linn & Marshall Co.
McClellan & Junkersfeld
Richey, Albert S.
Sanderson & Porter
Stevens & Wood
Stone & Webster Co.
White Eng. Corp., The J. G.
Engines, Gas, Oil or Steam
Westinghouse E. & M. Co.
Exterior Side Panels
Haskellite Mfg. Corp.
Fare Boxes
Cleveland Fare Box Co.
Johnson Fare Box Co.
Perey Mfg. Co.
Fare Registers
Electric Service Supplies Co.
Johnson Fare Box Co.
Fences, Woven Wire & Fence
Posts
American Steel & Wire Co.
Fenders and Wheel Guards
Brill Co., The J. G.
Cincinnati Car Co.
Consolidated Car Fender Co.
St. Louis Car Co.
Star Brass Works
Wood Co., Chas. N.
Fibre and Fibre Tubing
Westinghouse E. & M. Co.
Field Coils (See Coils)
Floodlights
Electric Service Supplies Co.
Floor, Sub
Haskellite Mfg. Corp.
Floors
Haskellite Mfg. Corp.
Forgings
Brill Co., The J. G.
Cincinnati Car Co.
Standard Steel Works
Frogs & Crossings, Tee Rail
Bethlehem Steel Co.
Ramapo Ajax Corp.
Wm. Wharton, Jr. & Co.
Frogs, Track (See Track
Work)
Frogs, Trolley
Electric Service Supplies Co.
Ohio Brass Co.
Westinghouse E. & M. Co.
Furnaces Electric, Steel
Melting
American Bridge Co.
Fuses and Fuse Boxes
Columbia Machine Works &
M. I. Co.
Consolidated Car Heating Co.
General Electric Co.
Westinghouse E. & M. Co.
Fuses, Refillable
General Electric Co.
Gaskets
Westinghouse Tr. Br. Co.
Gas Producers
Westinghouse E. & M. Co.
Gates, Car
Brill Co., The J. G.
Cincinnati Car Co.
St. Louis Car Co.
Gear Blanks
Brill Co., The J. G.
Standard Steel Works
Gear Cases
Chillingworth Mfg. Co.
Columbia Machine Works &
M. I. Co.
Electric Service Supplies Co.
Westinghouse E. & M. Co.
Gears and Pinions
Bemis Car Truck Co.
Columbia Machine Works &
M. I. Co.
Electric Service Supplies Co.
General Electric Co.
Nat'l Ry. Appliance Co.
Generating Sets, Gas-Electric
General Electric Co.
Generators
General Electric Co.
Westinghouse E. & M. Co.
Gilder Rails
Bethlehem Steel Co.
Lorain Steel Co.
Gongs (See Bells and Gongs)
Greases (See Lubricants)
Grinders, Portable
Railway Trackwork Co.
Grinders, Portable Electric
Railway Trackwork Co.
Grinding Bricks and Wheels
Railway Trackwork Co.
Guard Rail Clamps
Ramapo Ajax Corp.
Guard Rails, Tee Rail &
Manganese
Ramapo Ajax Corp.
Wm. Wharton, Jr. & Co.
Guards, Trolley
Elec. Service Supplies Co.
Ohio Brass Co.
Harps, Trolley
Columbia Machine Works
Elec. Service Supplies Co.
National Bearing Metals
Corp.
(More-Jones Brass & Metal
Co. (Div.))
Star Brass Works
(Continued on page 30)

AMERICAN BRIDGE COMPANY

EMPIRE BUILDING—71 BROADWAY NEW YORK, N. Y.

Manufacturers of Steel Structures of all classes particularly BRIDGES AND BUILDINGS

ALSO STEEL BARGES FOR HARBORS AND RIVERS, STEEL TOWERS FOR ELECTRIC TRANSMISSION, HEROULT ELECTRIC FURNACES, ETC.

SALES OFFICES:

NEW YORK, N. Y.
Philadelphia, Pa.
Boston, Mass.
Baltimore, Md.

PITTSBURGH, PA.
Cincinnati, Ohio
Cleveland, Ohio
Detroit, Mich.

CHICAGO, ILL.
St. Louis, Mo.
Denver, Colo.
Salt Lake City, Utah

Duluth, Minn.
Minneapolis, Minn.

Pacific Coast Representative:
U. S. Steel Products Co.,
Pacific Coast Dept.
San Francisco, Cal.
Los Angeles, Cal.
Portland, Ore.
Seattle, Wash.

Export Representative: United States Steel Products Co., 30 Church Street, New York.



Don't Overlook Opportunities

Men who regularly keep in touch with the market through other channels often overlook the many opportunities that are to be found in the

SEARCHLIGHT SECTION

For Every Business Want

"Think SEARCHLIGHT First"

0156

Lorain Special Trackwork Girder Rails

Electrically Welded Joints

THE LORAIN STEEL COMPANY

Johnstown, Pa.

Sales Offices:

Atlanta Chicago Cleveland New York
Philadelphia Pittsburgh Dallas

Pacific Coast Representative:

United States Steel Products Company
Los Angeles Portland San Francisco Seattle

Export Representative:

United States Steel Products Company, New York, N. Y.



Special Track Work of every description

THE BUDA COMPANY

Harvey (Suburb Chicago) Illinois

Kalamazoo Trolley Wheels

The value of Kalamazoo Trolley Wheels and Harps has been demonstrated by large and small electric railway systems for a period of thirty years. Being exclusive manufacturers, with no other lines to maintain, it is through the high quality of our product that we merit the large patronage we now enjoy. With the assurance that you pay no premium for quality we will appreciate your inquiries.



THE STAR BRASS WORKS
KALAMAZOO, MICH., U. S. A.

Bethlehem Products for Electric Railways

Tee and Girder Rails; Machine Fitted Joints; Splice Bars; Hard Center Frogs; Hard Center Mates; Rolled Alloy Steel Crossings; Abbott and Center Rib Base Plates; Rolled Steel Wheels and Forged Axles; Tie Rods; Bolts; Tie Plates and Pole Line Material.

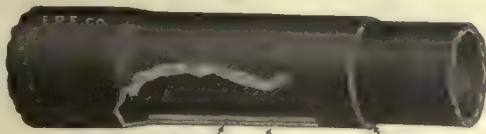
Catalog Sent on Request

BETHLEHEM STEEL COMPANY, Bethlehem, Pa.

BETHLEHEM

- Headlights**
Elec. Service Supplies Co.
General Electric Co.
Ohio Brass Co.
St. Louis Car Co.
- Headlining**
Columbia Machine Works & M. I. Co.
Haskelite Mfg. Corp.
Heaters, Bus
Nichols-Lintern Co.
Heaters, Car (Electric)
Consolidated Car Heating Co.
Gold Car Heat. & Ltg. Co.
Railway Utility Co.
Smith Heater Co., Peter
Heaters, Car, Hot Air and Water
Smith Heater Co., Peter
Heaters, Car Stove
Smith Heater Co., Peter
Helmets, Welding
Railway Trackwork Co.
Una Welding & Bonding Co.
Holds & Lifts
Columbia Machine Works & M. I. Co.
- Hose, Bridges**
Ohio Brass Co.
- Hose, Pneumatic**
Westinghouse Traction Brake Co.
- Instruments, Measuring, Testing and Recording**
American Steel & Wire Co.
General Electric Co.
National Ry. Appliance Co.
Westinghouse E. & M. Co.
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General Electric Co.
Irvington Varnish & Ins. Co.
Okonite Co.
Okonite-Callender Cable Co.
U. S. Rubber Co.
Westinghouse E. & M. Co.
Insulating Silk
Irvington Varnish & Ins. Co.
Insulating Varnishes
Irvington Varnish & Ins. Co.
Insulation (See also Paints)
Electric Ry. Equipment Co.
Elec. Service Supplies Co.
General Electric Co.
Irvington Varnish & Ins. Co.
Okonite Co.
Okonite-Callender Cable Co.
U. S. Rubber Co.
Westinghouse E. & M. Co.
- Insulation Slits**
Irvington Varnish & Ins. Co.
- Insulator Pins**
Elec. Service Supplies Co.
Hubbard & Co.
Ohio Brass Co.
- Insulators (See also Line Materials)**
Elec. Ry. Equipment Co.
Elec. Service Supplies Co.
General Electric Co.
Irvington Varnish & Ins. Co.
Ohio Brass Co.
Westinghouse E. & M. Co.
- Interior Side Linings**
Haskelite Mfg. Corp.
- Interurban Cars (See Cars)**
- Jacks (See also Cranes, Hoists and Lifts)**
Buda Company
Columbia Machine Works & M. I. Co.
Elec. Service Supplies Co.
- Joints, Rail**
(See Rail Joints)
- Journal Boxes**
Bemis Car Truck Co.
Brill Co., The J. G.
Cincinnati Car Co.
St. Louis Car Co.
- Lamp Guards and Fixtures**
Elec. Service Supplies Co.
General Electric Co.
Westinghouse E. & M. Co.
- Lamps, Arc and Incandescent (See also Headlights)**
General Electric Co.
Westinghouse E. & M. Co.
- Lamps, Signal and Marker**
Elec. Service Supplies Co.
Nichols-Lintern Co.
- Lanterns, Classification**
Nichols-Lintern Co.
- Letter Boards**
Cincinnati Car Co.
Haskelite Mfg. Corp.
- Lighting Fixtures, Interior**
Electric Service Supplies Co.
- Lightning Protection**
Elec. Service Supplies Co.
General Electric Co.
Westinghouse E. & M. Co.
- Line Material (See also Brackets, Insulators, Wires, etc.)**
Archbold-Brady Co.
Electric Ry. Equipment Co.
Elec. Service Supplies Co.
- General Electric Co.**
Hubbard & Co.
National Bearing Metals Corp.
(More-Jones Brass & Metal Co. (Div.)
Ohio Brass Co. (Div.)
Westinghouse E. & M. Co.
Locking Spring Boxes
Wm. Wharton, Jr. & Co.
Locomotives, Electric
Cincinnati Car Co.
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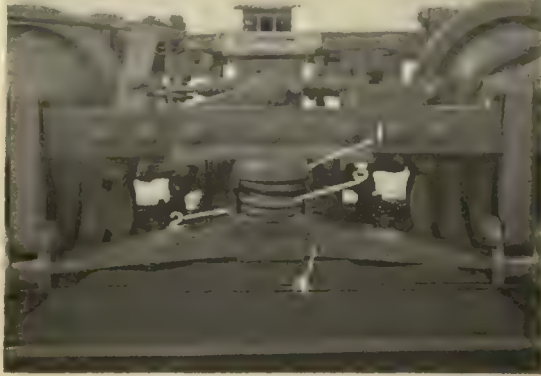
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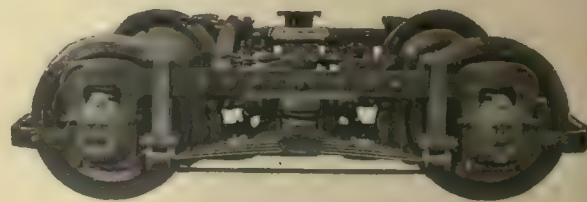
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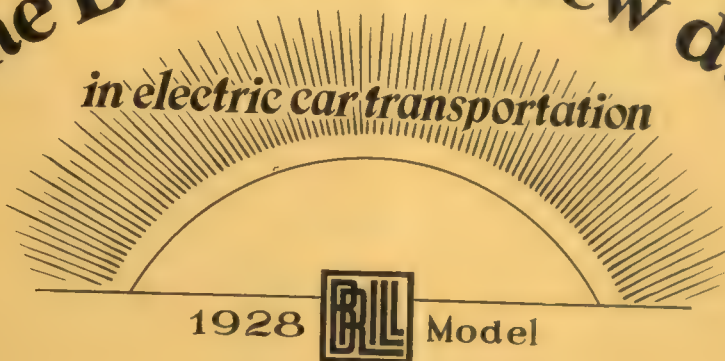
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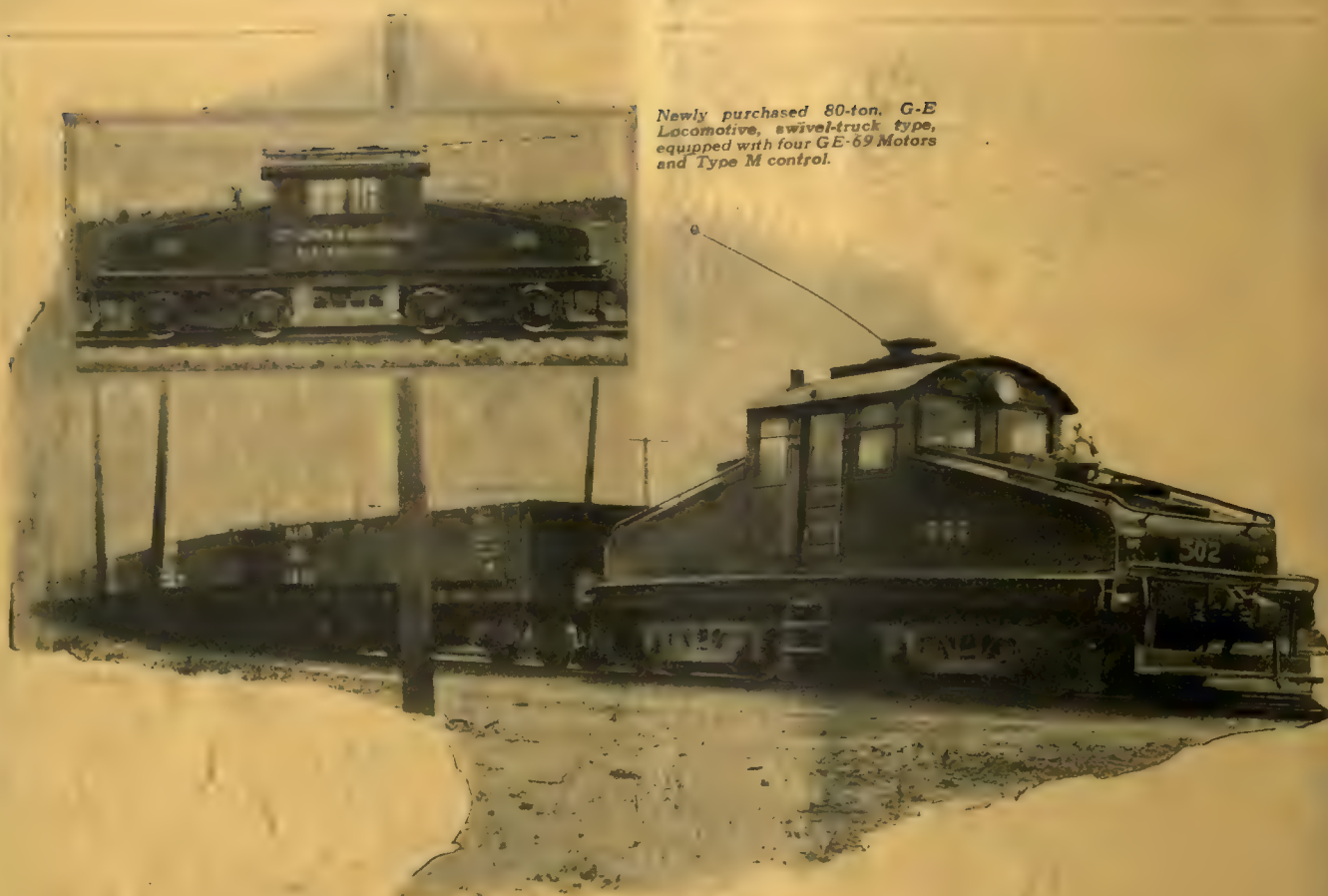
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in next issue.



Newly purchased 80-ton. G-E Locomotive, swivel-truck type, equipped with four GE-69 Motors and Type M control.

In service 25 years— still doing a full day's work

Early in 1901 two 50-ton G-E Electric Locomotives started to work for the St. Louis & Belleville Electric Railway Company.

The service has been exceptionally severe, yet these locomotives, with their original GE-55 Motors and Type L3 controllers, still make their daily run. Repairs have been slight—a new CP-30 Compressor, new trolley bases, and lightning arresters. And of special significance is the fact that maintenance costs for each locomotive have averaged only \$1180.00 per year for the past 16 years.

Rapidly increasing traffic made another locomotive necessary. Naturally it was purchased from General Electric because of the trouble-free service its predecessors had given.



In spite of the long period of service, these two G-E Locomotives will continue in operation assisted by the new 80-ton locomotive recently delivered. Records such as this have earned for G-E locomotives their reputation for dependability.

GENERAL ELECTRIC

GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y., SALES OFFICES IN PRINCIPAL CITIES

Annual Convention Number

ELECTRIC RAILWAY JOURNAL

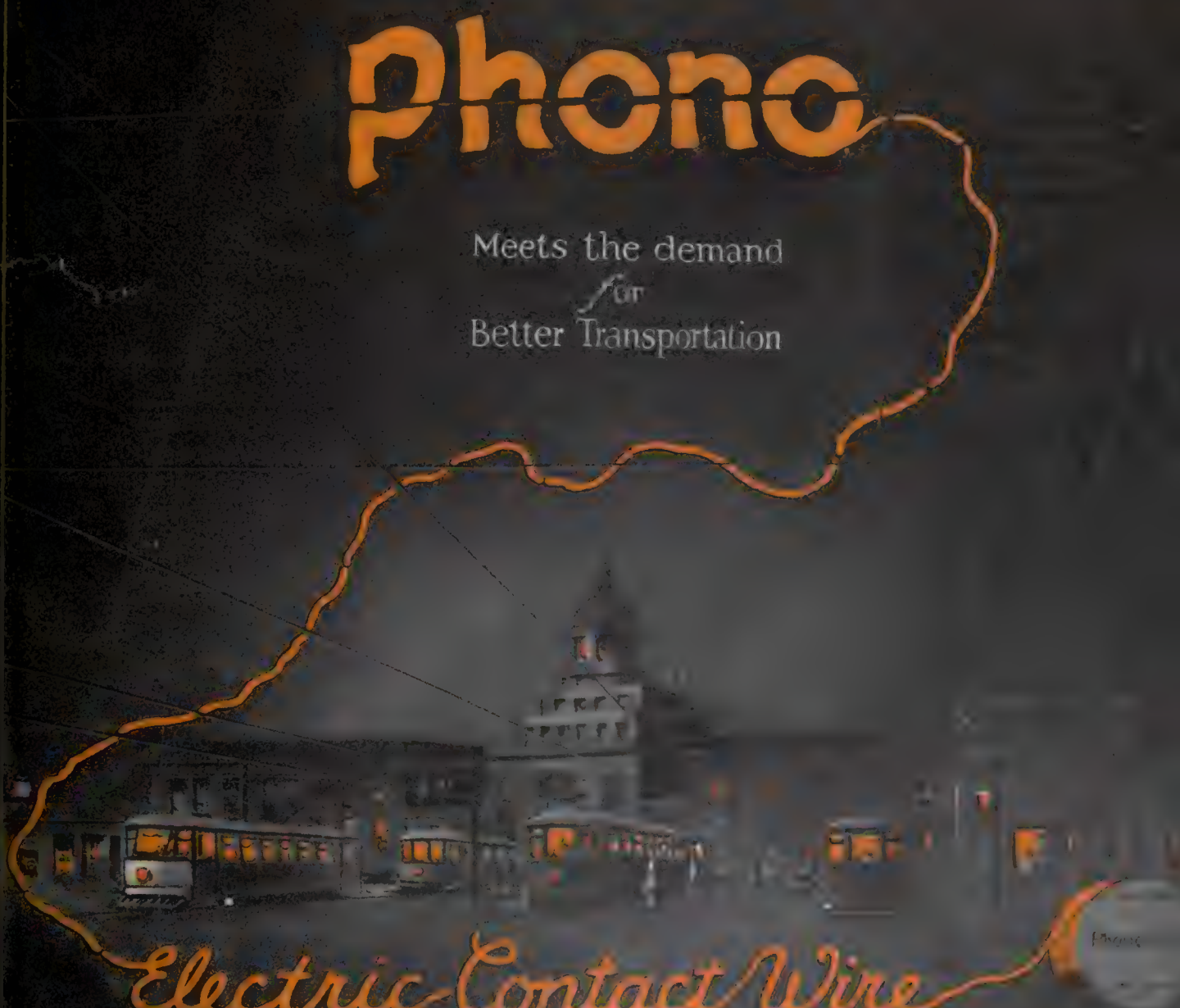
McGraw-Hill Publishing Company, Inc.

September 17, 1927

Fifty Cents per

phono

Meets the demand
for
Better Transportation



Electric Contact Wire

PHONO-ELECTRIC- PHONO-RI-CON- PHONO-WI-ST-CON-TH

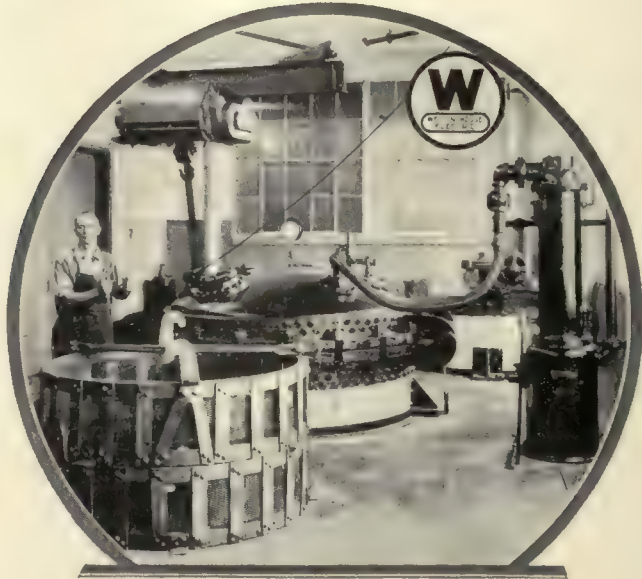
A complete wire service used by the leading electric railways

BRIDGEPORT BRASS CO.

COILS



Here is a Coil that is improperly impregnated. The gum penetrated only to the first few turns. Only the bare cotton insulation protects the main conductors. It has none of the dielectric, moisture, and heat-resisting qualities of a properly impregnated coil. Improper impregnation is a frequent cause of coil failure.



Here is a Coil impregnated by Westinghouse. It was taken from stock at random and cut. Note that the gum has penetrated every turn; that it has been forced into all of the insulation and filled all the air space between conductors. The entire coil is a solid mass, resistant to moisture. It has high dielectric strength. Because of its mass unity, it can better dissipate heat. It can better withstand the vibration and pounding incident to severe operating conditions.

And these are some of the precautions Westinghouse takes to assure a uniform quality of coils. Skilled men work under the supervision of capable engineers. Specially designed machinery provides constant heat and air pressure control. Tests are made of the gum to insure correct composition. Full time and pressure requirements are met; there is never any stinting or lowering of Westinghouse standards. Test coils are run regularly. If the test coil is not thoroughly impregnated, all apparatus in the run is treated again.

These precautions cost money. But they assure Westinghouse customers of dependable renewal parts. They save more than their additional cost in longer, more satisfactory service.

*The
Turning
Point
in street car service
has
arrived*

Westinghouse Electric & Manufacturing Company
East Pittsburgh Pennsylvania
Sales Offices in All Principal Cities of
the United States and Foreign Countries



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Vol. 70
No. 12

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1927

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Advertising Index—Alphabetical, 282; Classified, 276, 278, 280; Searchlight, 274, 275

This Way

to the Latest Development in Railway Engineering

WESTINGHOUSE is showing at the A. E. R. A. Convention the latest developments in electric equipment—meeting the demand for better transportation.

In the auditorium you will see a dual-ventilated motor with glass windows to reveal the circulating air; a 581. motor with its control like that used in America's newest subway—Broad St., Philadelphia; an electric motor and electric generator of the type used in the new coaches of the Public Service Railway; a complete line of renewal parts; electric track heaters that keep the switches operative in winter; the new Westinghouse Linestarter and Linestart motor for the shop that throw the motor directly across the line—safely—for higher starting torque.

Outside the hall, over tracks 1, 2, and 3, are the latest developments in

line material—direct-suspension, catenary suspension, and Westinghouse inclined catenary, the most up-to-date method of installing catenary overhead. On the tracks are many cars equipped with Westinghouse apparatus, including the new worm drive and the latest of all achievements, the Westinghouse WN Drive. Flanking the first five tracks, are Westinghouse lighting standards of Hollowspun concrete, illustrating the modern practice of combining trolley and light poles—for greater street-attractiveness.

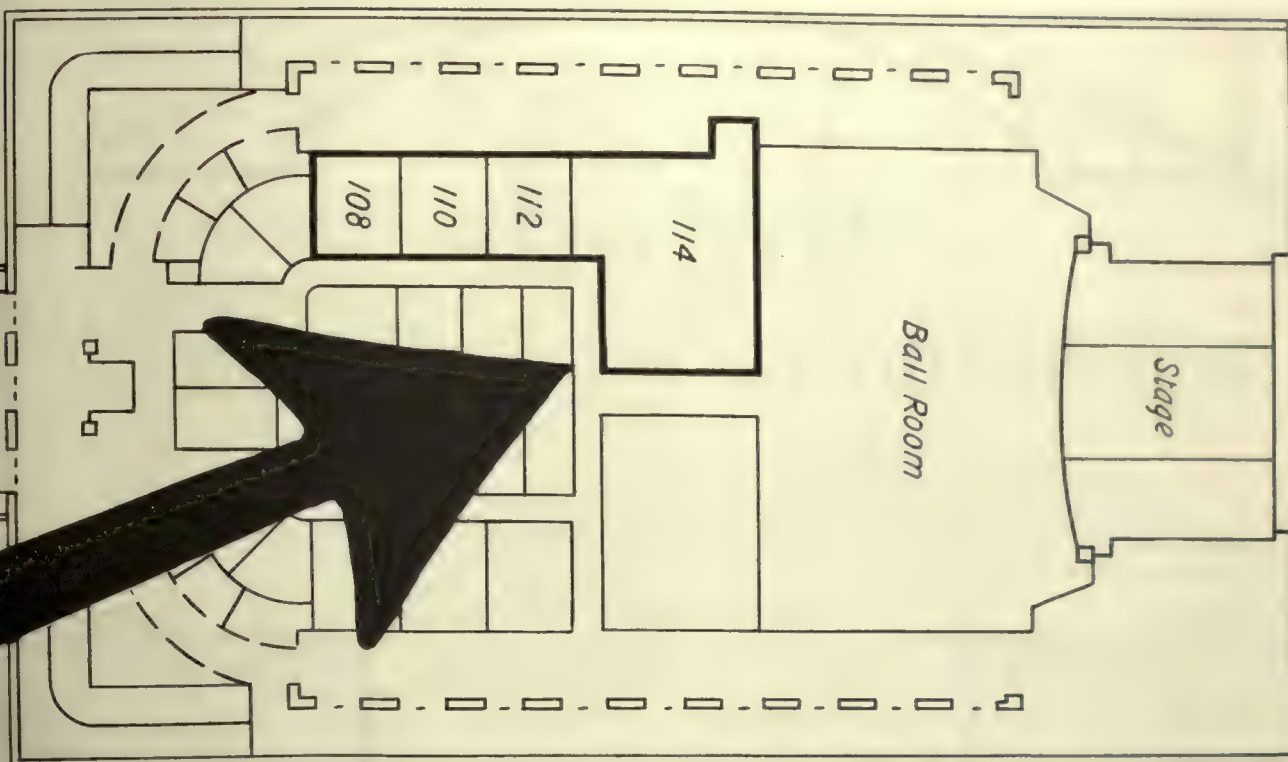
A special feature will be a complete Baldwin-Westinghouse 50-ton electric locomotive—the latest development in locomotive design.

And then there is the permanent Westinghouse exhibit in Cleveland—in the power stations, automatic substations, shops, cars, and lines of the Cleveland Railways Company. Here you can see Westinghouse power and railway equipment in actual operation—at the A. E. R. A. Convention in Cleveland.

Westinghouse Electric & Manufacturing Company
East Pittsburgh Pennsylvania

Sales Offices in All Principal Cities of
the United States and Foreign Countries

Westin



Westinghouse Exhibit

Booth Nos. 108-110-112 & 114

and

Track Nos. 1-2 & 3

A.E.R.A. CONVENTION

Cleveland, Oct. 3-7



1927

ghouse

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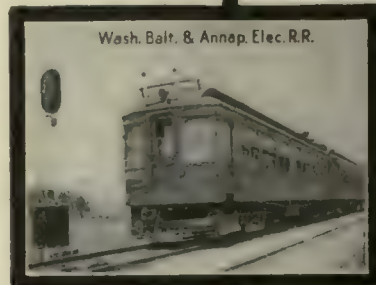
Signals

and their Diversified Applications.

Have you more than scratched the surface to uncover available means of protecting and speeding up your traffic, and are you experiencing delays or perhaps accidents which might be eliminated by the use of one or more of the following means?



1.—Automatic semaphore or color light block signals, controlled by continuous track circuits.



2.—Electro-pneumatic, electric, electro-mechanical, or purely mechanical interlocking systems at terminals or at grade crossings with other railway lines.



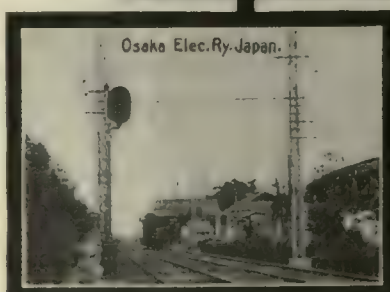
3.—Highway crossing protective devices of flashing color light, wig-wag and audible types or combination of same.



4.—Remotely controlled switches at outlying sidings.



A statement of your problem places you under no obligation and if it appears to our engineers that your conditions can be improved by installation of our materials, we shall be glad to furnish complete details.



Electric Railways which are large users of Union automatic signal and interlocking systems are:

Chicago, Lake Shore & South Bend Ry. Co.
Chicago, South Bend & Northern Indiana Ry.
Kansas City, Clay County & St. Joe Ry. Co.
Washington, Baltimore & Annapolis Elec. R. R.

Interstate Public Service Co.
Pacific Electric Ry. Co.
Illinois Traction System
United Elec. Rys. Co.

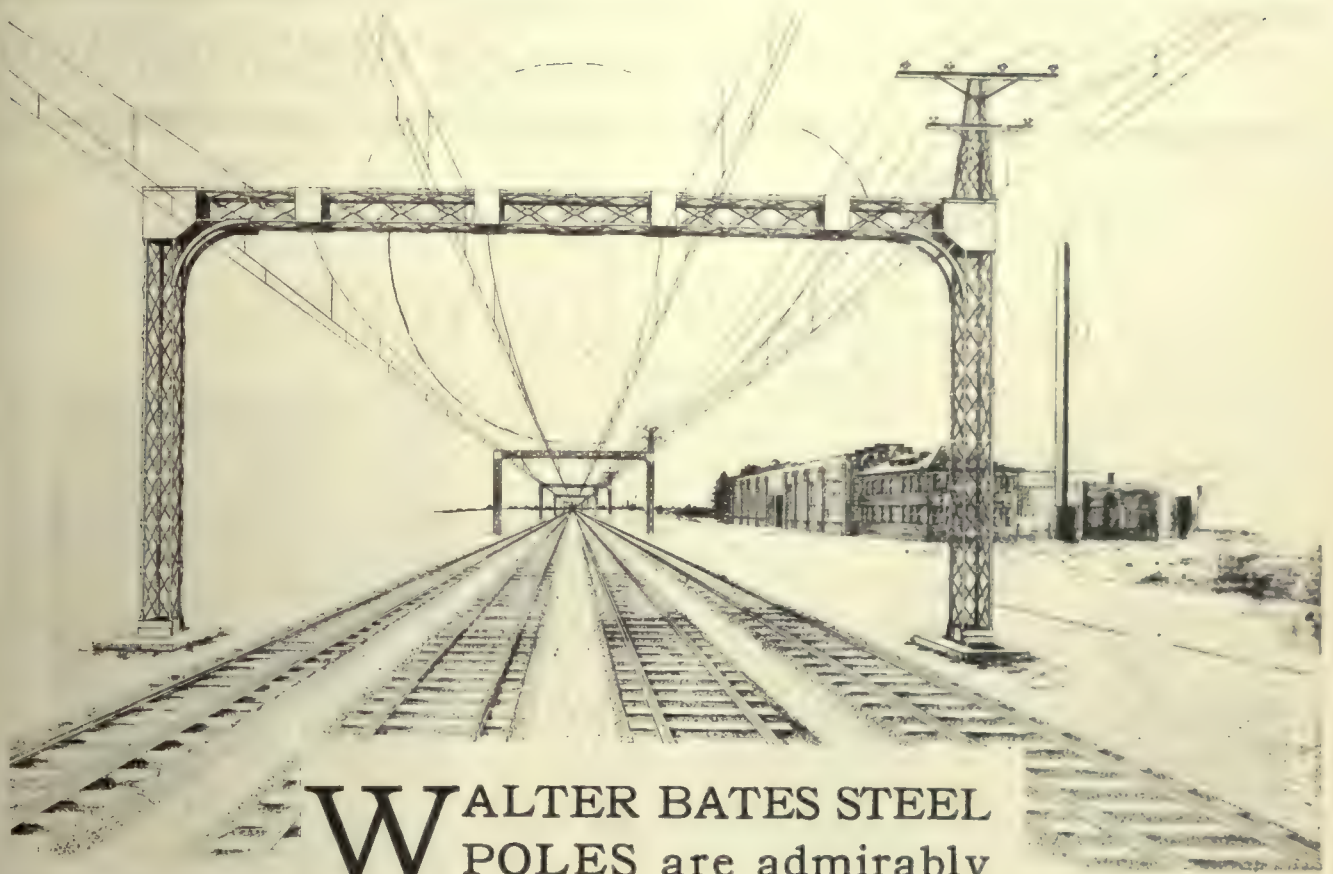
Scranton & Binghamton R. R. Co.
United Railways & Elec. Co.
San Francisco-Sacramento R. R.
Northern Texas Traction Co.



Union Switch & Signal Co.

SWISSVALE, PA.





WALTER BATES STEEL POLES are admirably adapted for overhead structures of all kinds, and prove to be most economical. The above sketch shows a structure composed of three units, two poles and a truss, each being of type 3 construction. Neatness and durability are outstanding features.



Type 3 is square
in section



WALTER BATES STEEL CORPORATION

GARY

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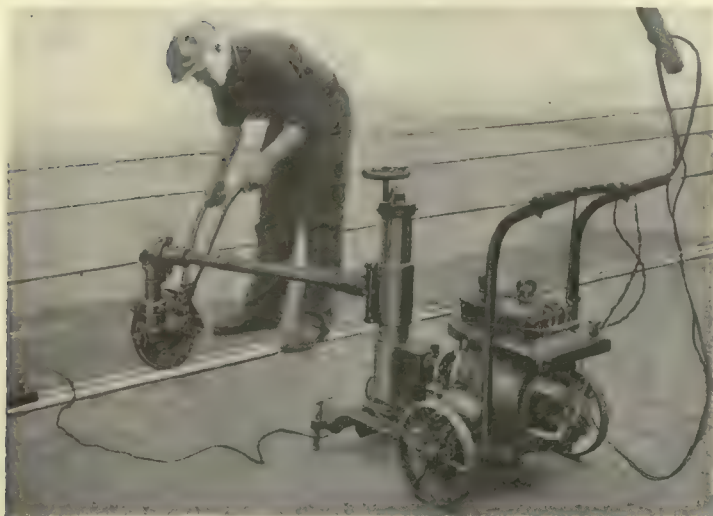
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BETTER TRANSPORTATION

Here's the newest aid to track betterment



Flexible manipulation of grinding wheel is made easy.



Grinding wheel arm swings aside to pass cars without removing trolley pole.

Eureka Radial Rail Grinder

A small, light, portable grinder for use where flexible manipulation of the grinding wheel is desirable. Fine for grinding Thermit joints before finishing with the "Vulcan" which then makes a perfectly smooth joint.

Eureka is also suitable for grinding off surplus weld metal under heavy traffic conditions. Swivel joints permit tilting the grinding wheel at any angle, at the same time allowing grinding wheel to travel in a straight line. A small hand wheel

raises and lowers the grinding wheel. Ball and roller bearings keep friction minimized.

Eureka, with grinding wheel, weighs 375 pounds. It's 46 in. from grinding wheel to vertical column extended, 36 in. when telescoped.

With arm swung into position against handles. Eureka measures 40 in. overall, 26 in. wide, 34 in. high. The 10 in. diameter, 1 in. face grinding wheel runs at 1950 r.p.m., with a 1 1/2 hp., 550 v. d.c. ball bearing motor, made especially for its job.

**See Eureka and the other good
grinders at the Convention
Space No. 216, 313, 315**

Railway Trackwork Co.

3132-48 East Thompson Street, Philadelphia

AGENTS:

Chester F. Gailor, 30 Church St., New York
Chas. N. Wood Co., Boston
Electric Engineering & Mfg. Co., Pittsburgh
H. F. McDermott, 208 S. LaSalle St., Chicago
Equipment & Engineering Co., London
P. W. Wood, Railway Supply Co., New Orleans, La.
Frazar & Co., Japan



Eureka with Outtrigger for open track.

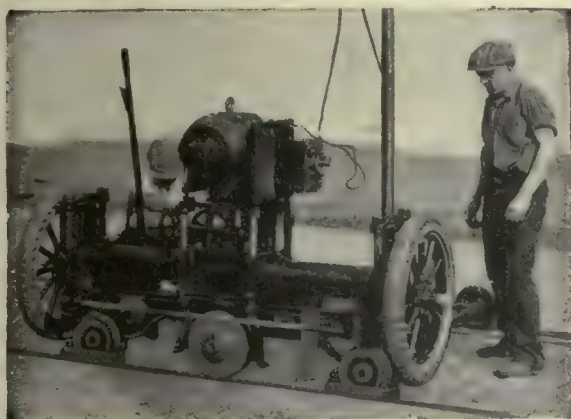
DEMANDS BETTER TRACK

Here are other standard aids on successful roads

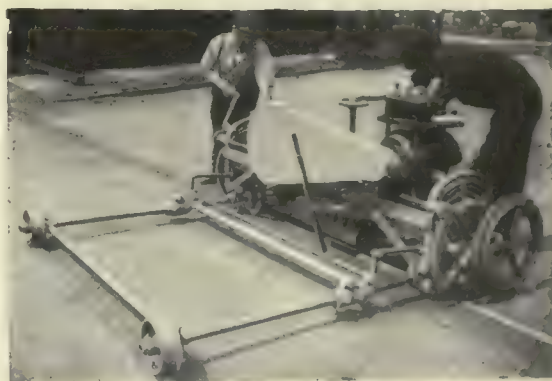


Reciprocating Track Grinder

See these and our other accepted maintenance equipment at the Convention—Spaces 216, 313, 315.



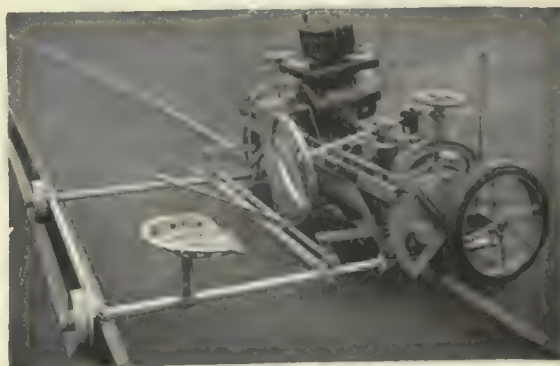
"Imperial" Track Grinder



"Vulcan" Rail Grinder



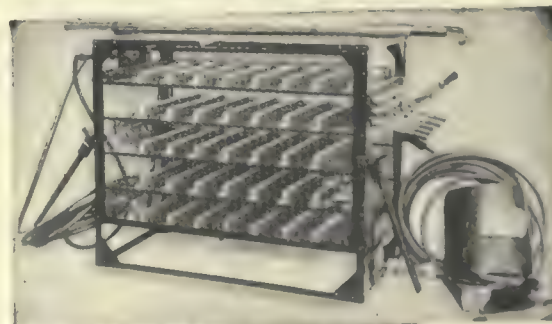
"Hercules" Swing Frame Rail Grinder



"Improved Atlas" Rail Grinder



"Midget" Rail Grinder



"Atlas" Electric Arc Welder

Mr. General Manager

ARE you giving your Superintendent of Overhead an opportunity to effect economies in trolley wire maintenance similar to those you expect from the roadway and mechanical departments?

He knows about the triple life of Phono-Electric, as compared with copper, and can name for you railway properties that have used it over a period of thirty years.

Meanwhile ask the Bridgeport Brass Company to send you the latest Phono Booklet. It contains wire information and tables which will surely be of interest to you.

While you are at the Cleveland Convention, stop in at Booth 269 and talk with our representatives regarding the possibilities of Phono as an economy measure on your property.

DOLLARS *and* SENSE!

An era of prosperity for the electric ways is just in the offing as a result of high interest developing all through the industry in making those detail improvements in every phase of operation, which, totalized, contribute substantially to the net.



The Importance of Small Economies

REMEDY for the low net of the electric railways is, for the most part, the summation of results obtained from manifold improvements all along the line. But very often the importance, in this respect, of some of the very small things is not fully appreciated.

For example, it is of sufficient moment to substitute trolley ears that will give even 40% increase in ear life.* The economy in ears is nice, worth making. But this is only the first of a series of economies resulting.

An ear may cost 55 cents, but its installation costs at least 50 cents more. (†) Another economy then comes from encountering these costs only 60% as often. A property formerly using 40,000 ears per year, by using the improved design would save 16,000 ears and their installation cost, or roughly \$16,000 a year. But with 16,000 ears less to be replaced, one, possibly two, line crews might be released, with all their equipment and overhead expense.

A bigger saving than that made on ears is realized from the protection these modern ears give the trolley wire, thus making the very important contribution of postponing wire replacement. Again, with fewer ear and wire renewals there are fewer occasions for the line crews to cause possible delay to moving cars. And that is the biggest thing of all. Delays cause not only mounting expense from fewer car-miles per car-hour, but also loss of revenue from dissatisfied passengers. For speed is the essence of service in this age of automobile competition.

By the same token, a small car equipment device, if poorly made, may cause delays, even pull-ins, and annoyance to passengers, the cost of which to the company will be many times the comparatively small first cost of the device.

This effort to design for service, not to a price, applies to all O-B equipment and materials, and it is directly in support of the industry-wide problem of improving the net.

And so it is that O-B products have an importance far beyond that measured by their cost, in contributing to economies and the regularity and speed of the passenger service. Most of them are small items, but all designed, improved, perfected with this ultimate object in view. A few of these small O-B products are shown on the next two pages.

Don't belittle possible *small* savings, for on the average electric railway, a saving of 1% in operating expense will add nearly 20% to the net. Many small economies easily attained soon make a big saving and a substantial increase in the net.

*One property formerly used 41,000 ears per year. Substituting O-B Marathon ears, the first annual order for 41,000 filled requirements for 2½ years. Marathon ears average over 200,000 car passes while any ear manufactured previous to the Marathon did well to average 65,000 car passes.

(†) It costs practically as much to install a 9-inch cheap ear as it does a standard 15-inch Marathon ear.

Statistics of the industry a whole reveal a split-up the average fare as illustrated below. The net come is only 5.7%. Just per cent saved from 69.5% now devoted to operating expenses would make the net 6.7%—an increase nearly 20%.



Ohio Brass Company, Mansfield, Ohio
Dominion Insulator & Mfg. Co., Limited
Niagara Falls, Canada
494CB

Ohio Brass Co.

SALES OFFICES: NEW YORK CHICAGO PHILADELPHIA PITTSBURGH CLEVELAND SAN FRANCISCO LOS ANGELES

PORCELAIN INSULATORS
LINE MATERIALS
RAIL BONDS
CAR EQUIPMENT
MINING MATERIALS
VALVES



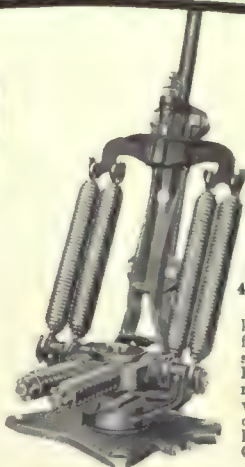
O-B Trolley Retriever

Automatically stops and pulls down a flying pole the instant it leaves the wire. Affords most dependable protection to overhead system. Cat. page 760.



Improved O-B Wheel and Harp

For city service only. Eliminates all oiling. Reduces maintenance and replacements. Prevents rapid wear on overhead. Cat. page 774.



O-B Form 4 Base

Floats on Timkens. Has perfectly balanced spring assembly. Insures instant response to every variation of the overhead; low upkeep, long life. Cat. page 776.



Type SDP Headlight

Takes 250-watt lamp. 12-in. dia. glass or metal reflector in Gold, Crystal or Sterling Ray. Casing, sheet steel. For suburban and interurban service. Cat. No. 28579.



O-B Trolley Catcher

Catches and holds a flying pole. Positive "anti-step-up" feature prevents damage to overhead. "One Shot" lubrication. Exceptionally low upkeep. Cat. page 758.



O-B Tomlinson Automatic Coupler

Makes both air and electric connections. Coupled and uncoupled automatically from platform. Interlocking disconnecting switch insures safe operation. Cat. pages 780-878.



Type DCP Headlight

A 500-watt lamp and 11-in. reflector provide the maximum illumination in an incandescent headlight. It is ideal for high speed interurban cars. Cat. No. 29587.

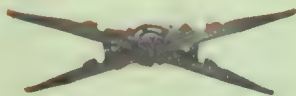


At the Convention

See the modern city and interurban cars recently placed in service by the Cincinnati, Hamilton & Dayton Railway Company. These cars are equipped with O-B Trolley Bases, O-B Retrievers, O-B Headlights, O-B Tomlinson Automatic Couplers.



Small Items That Afford Far Reaching Operating Economies!



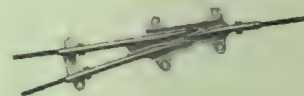
O-B LIVE CROSS-OVER

CAM Tip Approaches and Graduated Runners prevent arcing, pounding trolley wheels. Result—less vibration and wear, fewer line breaks. Has deflector bars and combined brace and pull-off ring. Cat. page 579.



O-B LOCK HANGER

A STEEL spring washer provides an absolutely tight joint between hanger and ear. The spring washer makes it unnecessary to back off the ear to align it with the wire, avoiding the usual "play." Cat. page 467.



O-B TYPE BC FROG

PERMITTS wheel to travel on its groove instead of on flanges, resulting in longer life. On tests made by five properties BC Frogs averaged nearly half a million car passes. Many gave even longer service. Cat. page 573.



O-B SECTION INSULATOR

ENTIRE trolley tension is sustained by two wood strain insulators in the same plane as the trolley wire. There is no buckling strain. Renewable fibre runner pieces cannot warp. Rocker clamps hold wire firmly without damage. Cat. page 557.



O-B TITON BOND

LARGE heavy steel terminals open on side facing rail. They make good welding easy, insure large contact area, high mechanical strength, excellent conductivity. Internal copper sleeves protect strands against vibration. Cat. page 667.



O-B INSULATED CROSS-OVER

ATHOROUGHLY seasoned hickory beam, impregnated and varnished, provides a sturdy and durable insulating member. End castings are Flecto galvanized malleable iron. Wire is held by rocker clamps, the holding power increasing with tension. Cat. page 584.



O-B TROLLEY GUARD

MAKES steam road crossings "Safety Crossings." Prevents dewirements due to trolley jumping. Low in cost, light, strong, durable, easily installed. 10-ft. lengths formed at factory. Shipped crated. Cat. pages 586-91.



O-B RENEWABLE CAM TIPS

AFFORD an unusually smooth approach and leave. Easily installed, no bolts or nuts. Used with O-B frogs, crossovers, section insulators. Cam action holds wire firmly in bottom of groove; prevents creeping or slipping. Cat. page 578.



O-B PORTABLE ARC WELDER

MARKS a new high standard in resistance welder performance. Unit construction cuts voltage stress in half, permits perfect insulation and ventilation, affords maximum durability. Has safety control. Cat. No. 14969.



O-B TYPE C SPLICER

HOLDING power exceeds strength of new wire. O-B Tapered Approaches, very narrow cross section and flat, smooth underrun, result in minimum disturbance to passing trolley wheel. Quickly installed. Cat. page 542.



O-B SPRING LOCK HANGER

A SHOCK absorber that takes the hard spots out of the overhead. Provides a cushion between ear and bracket arm or span. Affords smooth, quiet operation, less wear and depreciation. Cat. page 465.



O-B MARATHON TROLLEY EAR

EXCEPTIONALLY long life—420,000 car passes and more; far fewer ear renewals and line breaks; less cost per year for labor and materials; these results explain world-wide use. Cat. page 534.

AERA
Convention
Booth
No. 115

Ohio Brass Company, Mansfield, Ohio
Dominion Insulator & Mfg. Co., Limited,
Niagara Falls, Canada
494CB

Ohio Brass Co.

SALES OFFICES: NEW YORK
CHICAGO

PHILADELPHIA PITTSBURGH CLEVELAND
SAN FRANCISCO LOS ANGELES

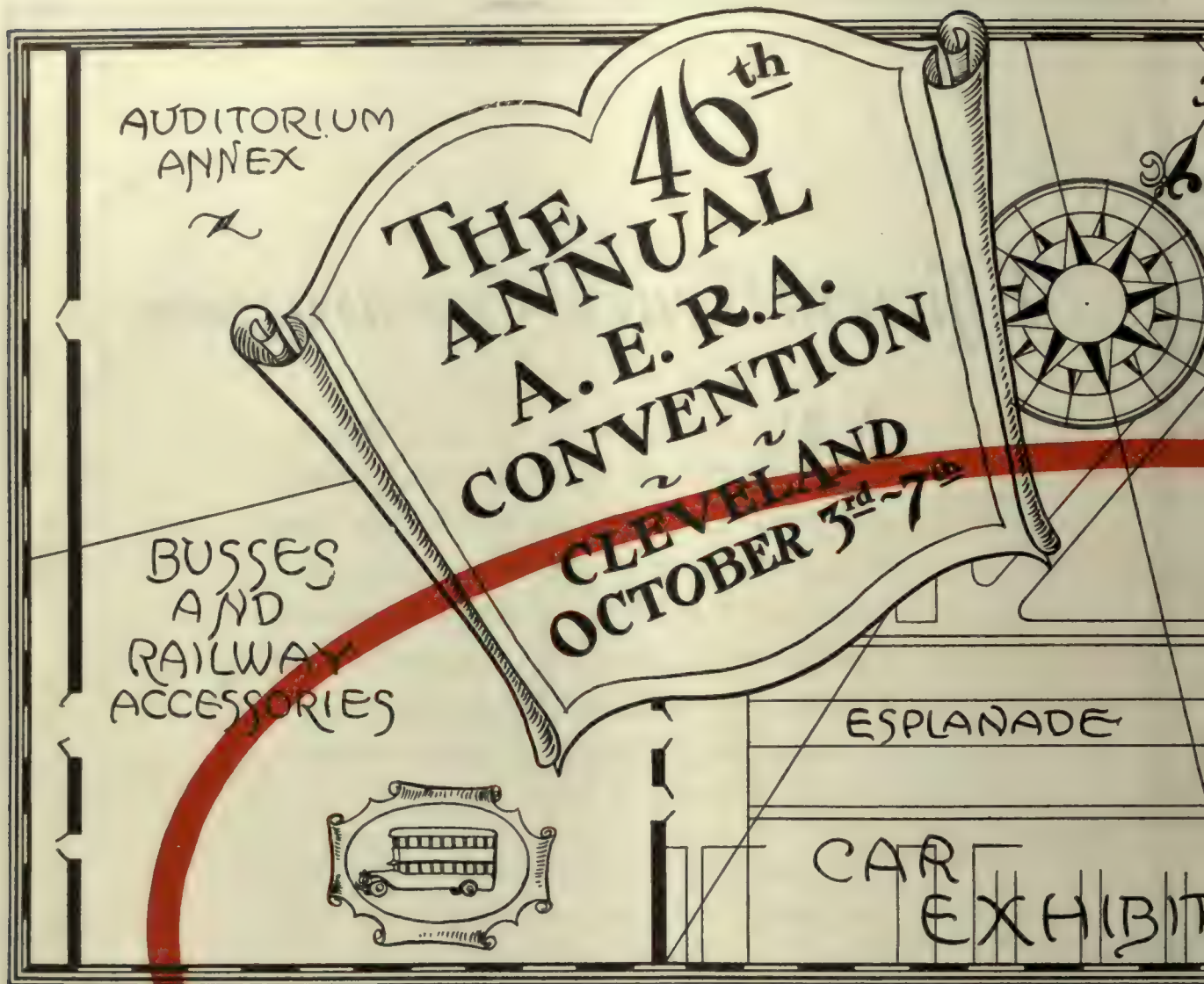
PORCELAIN
INSULATORS
LINE MATERIALS
RAIL BONDS
CAR EQUIPMENT
MINING
MATERIALS
VALVES

Efficient Track Construction

MUCH remains to be done to fit paved track construction methods and general efficiency into the new and progressive administration of Electric Railways which are doing so much in "meeting the Demand for Better Transportation," the theme of this Convention issue of the Electric Railway Journal.

One individual contribution to this purpose for the coming year has been to bring together in one of the largest exhibits ever devoted to paved track exclusively, such of the outstanding devices and methods as are being used in the largest track construction programs today.

*(This exhibit is described
in the following pages)*



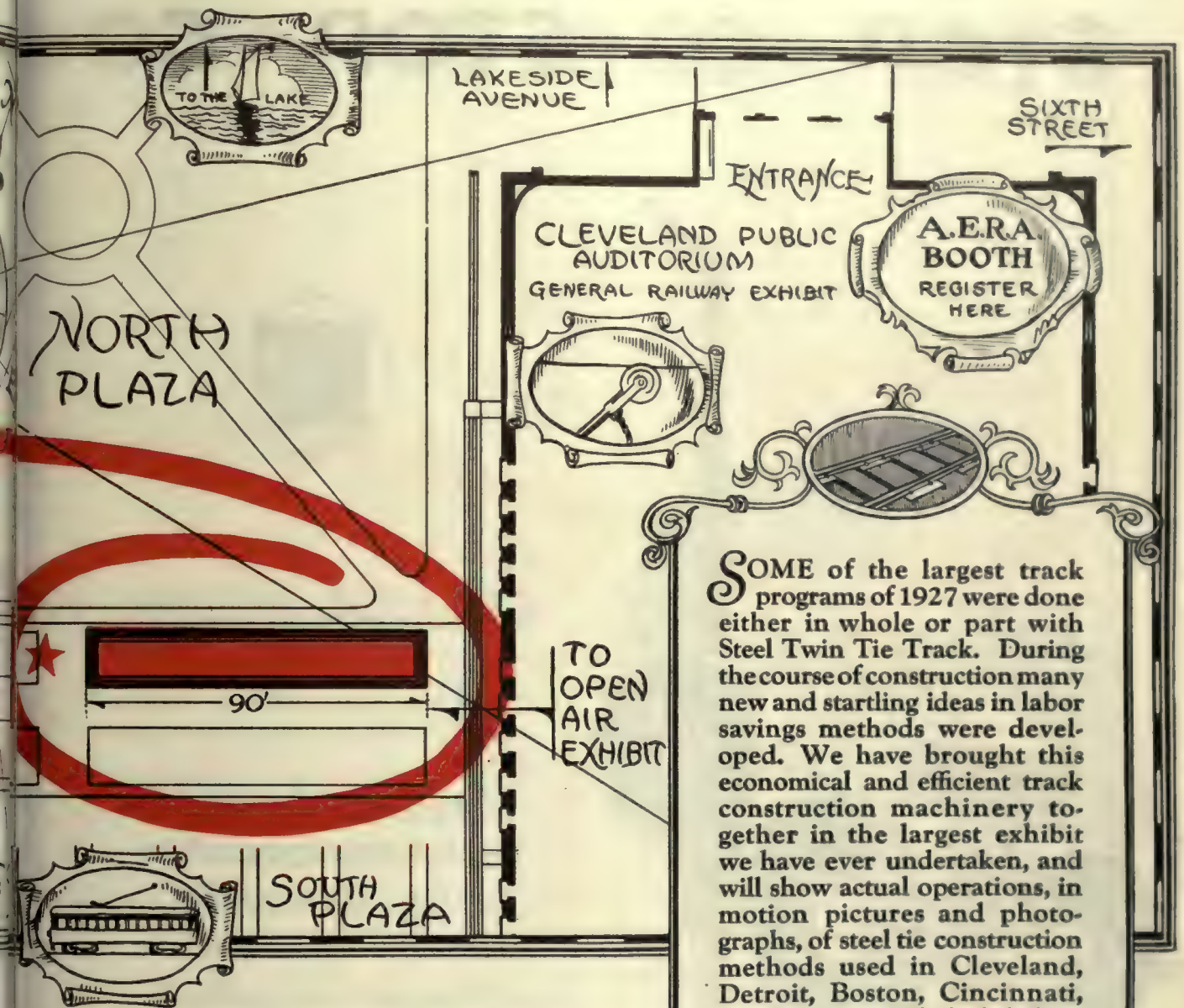
1080 Square Feet of C
Labor Saving Machine
for Paved Trac

THE INTERNATIONAL STEEL TIE COMPANY

Spaces — 300, 302, 304, 306, 308



STEEL TWIN



SOME of the largest track programs of 1927 were done either in whole or part with Steel Twin Tie Track. During the course of construction many new and startling ideas in labor savings methods were developed. We have brought this economical and efficient track construction machinery together in the largest exhibit we have ever undertaken, and will show actual operations, in motion pictures and photographs, of steel tie construction methods used in Cleveland, Detroit, Boston, Cincinnati, Washington, Philadelphia, Kansas City, Baltimore, Atlanta, Toledo, Akron, Harrisburg, Albany, Binghamton, Salt Lake City, Youngstown, Tacoma, Buffalo, Allentown and Fort Wayne.

Operating Exhibit and Methods Construction

CLEVELAND, OHIO, U. S. A.

310, 312, 314 and 316

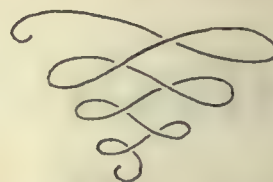
TIE TRACK

STOP ~ GO ~ STOP ~ GO ~



CIRCULATING LOAD

Meets the demand for
better transportation
under increasingly
difficult conditions
of traffic congestion.



Booth 107-9-11
A. E. R. A. Convention

NATIONAL

STOP ~ GO ~ STOP ~ GO ~



MODERN transportation involves a never-ending series of STOP'S and GO'S. The demand becomes more and more pressing for time-saving expedients to balance increasing delays from traffic congestion.

Since 1905 the National Pneumatic Company has lead in the development of door and step operating apparatus for just this purpose. The N-P Circulating Load Method is the last word in the use of modernized equipment of this class.



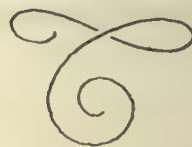
PNEUMATIC

IN ~ OUT ~ IN ~ OUT



CIRCULATING LOAD

Meets the demand for
better transportation
by handling heavier
passenger loads
with greater speed
and safety.



Booth 107-9-11
A. E. R. A. Convention

NATIONAL

IN ~ OUT ~ IN ~ OUT ~



NATIONAL Pneumatic boarding and alighting systems are an up-to-date development used by scores of modernized railway properties.

It has been positively demonstrated that the proper application of N-P door operating equipment with the automatic treadle door device will solve practically every passenger interchange problem. This equipment is adapted to every type of car and also to buses.

How it is done—and where—will be shown in detail at the Convention—Booth 107-9-11.



PNEUMATIC

Layer upon layer — of lasting rock

WHEN the roof itself is built of layers of everlasting asbestos rock, neither gravel nor any other kind of surfacing is needed. Paint or other preservatives have no place on a Johns-Manville roof.

The surface is smooth and even. No gravel, clogged drain pipes to cause dismay.

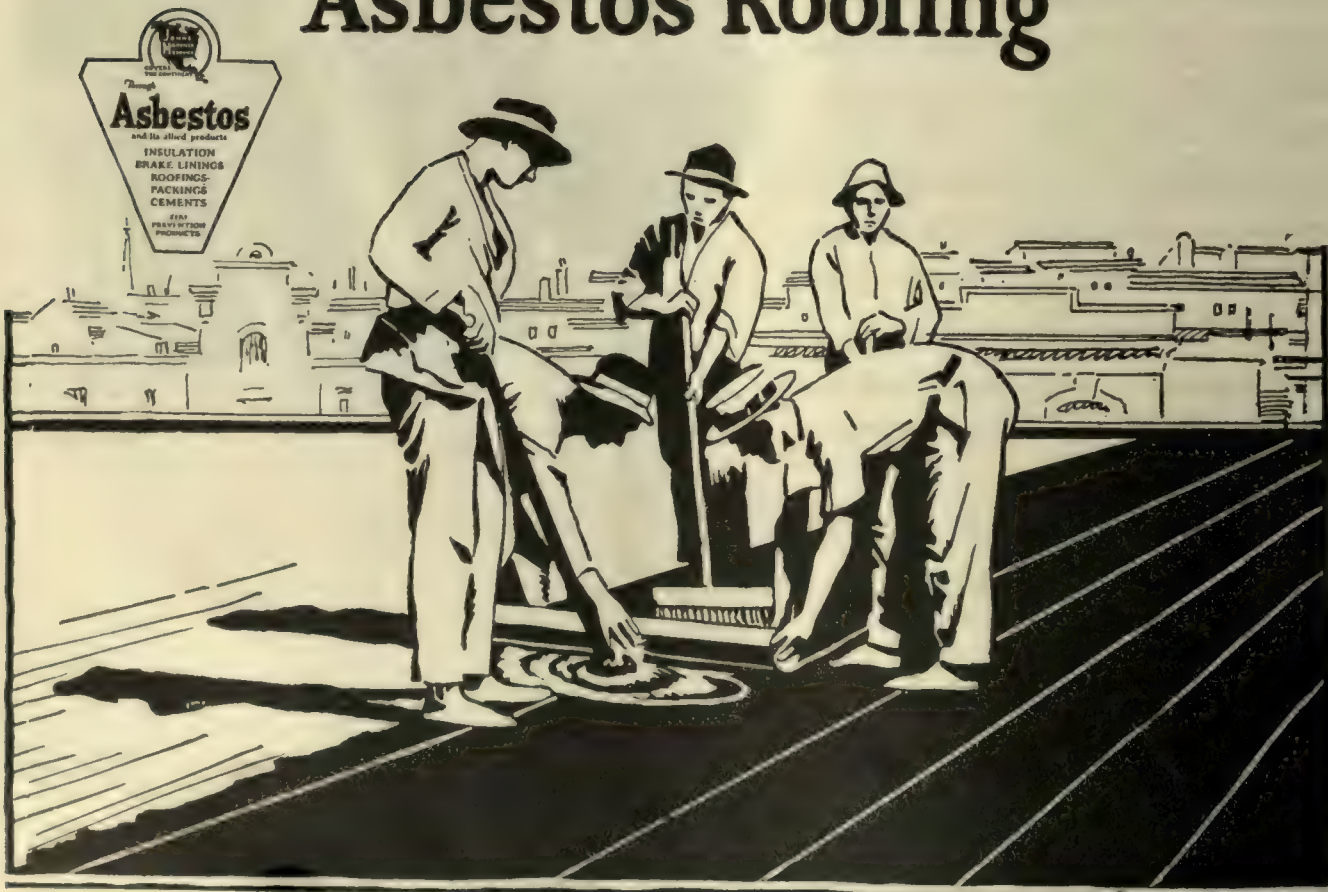
When the valleys and flashings, where 90% of all ordinary roofing troubles occur, are specially flashed with our material absolute weathertightness is insured.

The remarkable freedom from maintenance costs alone is sufficient to recommend this roofing.

JOHNS-MANVILLE CORPORATION, 292 Madison Ave. at 41st St., New York City
Branches in all large cities.

For Canada: CANADIAN JOHNS-MANVILLE CO., LTD., TORONTO

JOHNS-MANVILLE Asbestos Roofing



Public Service

(New Jersey)

buys

YELLOW COACHES

How this Fleet has Grown

Date	Public Service
January 25, 1924	2
April 13, 1924	24
December 3, 1924	50
December 29, 1925	333
April 30, 1926	54
July 10, 1926	8
August 2, 1927	20
Acquired by purchase of other lines	31
TOTAL	522

for the
7th
time!



Salesmanship may play a part in the initial
the strength of performance and knowledge

In 1926

Of total YELLOW COACH
sales to Utilities repeat orders
constituted 75%

Of entire YELLOW COACH
factory output, these repeat
orders represented 60%



Out of total number of Electric
Railways purchasing motor
coaches, those buying Yellows
were 46%

Of total number of motor
coaches bought by all Electric
Railways, in 1926, Yellows
were 40½%



purchase—but repeat orders are placed on gained by experience

Jan. 1 to Sept. 1, 1927

Of all YELLOW COACH sales to Utilities, repeat orders constituted	92%
---	-----

Of entire YELLOW COACH factory output, these repeat orders constituted	66%
--	-----

Repeat orders indicate the satisfaction arising from dependable and economical operation.

Where YELLOW COACHES go in, more YELLOW COACHES follow.



Some of the Utilities that bought YELLOW COACHES last month—

Cleveland Railways	10 Coaches
Public Service (<i>New Jersey</i>)	20 Coaches
Southern Pacific Motor Transport . .	22 Coaches
Washington Rapid Transit	31 Coaches
A. B. & W. Transit	10 Coaches
Insull Properties	5 Coaches

Nearly three times as many
YELLOW COACHES
were bought last year by
Electric Railways as
any other single make.

YELLOW COACHES
A General Motors Product

YELLOW TRUCK & COACH MANUFACTURING CO.
SUBSIDIARY GENERAL MOTORS CORPORATION
5801 WEST DICKENS AVENUE, CHICAGO, ILL.



Above—New station of the Southern Pacific Railway, Redlands, Calif.

At left—Concrete train shed, Southern Pacific Railway, Sacramento, Calif.

For Modern Railway Structures

MANY of America's progressive railroads, among them the Southern Pacific Railway Company, are finding in portland cement concrete the ideal building material for stations, train sheds, signal towers, bridges and other structures which are duplicated at various locations.

Precast concrete units, which are extensively used in such installations, are manufactured according to factory principles of production and quality control, thus combining economy of cost with full flexibility of arrangement and size.

Rail structures of portland cement concrete are firesafe, and successfully withstand the attacks of climate and constant use.

PORTLAND CEMENT Association

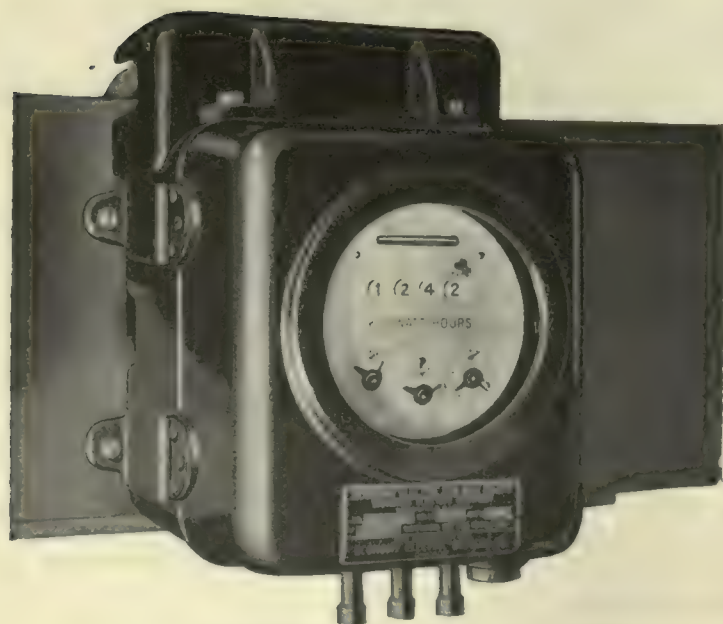
Concrete for Permanence

CHICAGO

Cleveland

Here are the Actual Results:

Month	Kw.-Hrs.	Car Miles	Kw.-Hrs. per C-M	Per Cent Saving
May-1926	7,404,905	2,772,479	2.67	11.9
June.....	7,314,503	2,740,373	2.67	11.9
July.....	7,243,884	2,741,731	2.64	12.9
August.....	7,267,458	2,758,490	2.63	13.2
September.....	7,059,726	2,655,814	2.66	12.2
October.....	7,346,130	2,706,242	2.71	10.6
November.....	7,404,436	2,691,677	2.75	9.3
December.....	7,454,788	2,670,238	2.79	7.9
January-1927	7,831,324	2,776,043	2.82	6.9
February.....	7,375,421	2,653,707	2.78	8.3
March.....	7,515,793	2,723,653	2.76	8.9
April.....	7,575,851	2,763,609	2.74	9.6
May.....	7,451,220	2,748,918	2.71	10.6
June.....	7,259,212	2,684,764	2.70	10.9
July.....	7,175,230	2,673,863	2.68	11.6



The Cleveland Railway Company, early in 1925, ordered 1076 Economy Meters with which to equip all its active motor passenger cars. Installation was completed by August, 1925. Since that time, by means of the meter, and a very efficiently directed power saving campaign, these worthwhile economies have been gained.

Economy Meters

Saves Power



Economy Railway Watthour Meters—

For Measuring Traction Energy on Electric Railway Cars and Locomotives and on Gas-Electric Rail Cars and Buses.

More than 200 properties, operating more than 25,000 cars, are using ECONOMY Watthour Meters. The primary purpose is to save energy by stimulating competitive interest between motormen. Such savings usually range from 10 to 15% of the total traction energy.

Another important feature of the ECONOMY Meter is the "Car Inspection Dial" by means of which car equipment inspection intervals are scientifically determined in accordance with the actual work done.

This meter, built by the Sangamo Electric Company, has mercury-cushioned rotating parts which assure high accuracy under railway and gas-electric operating conditions.

Economy Electric Devices Company

37 W. Van Buren St., Chicago

Distributors or Agents for

Sangamo Economy Meters
Peter Smith Heaters

Woods Fare Boxes
Bemis Boyerized Truck Specialties



Giving Impetus to Transportation Service

SPEEDY transportation is vital to present-day conditions. Car riders want it; car owners need it.

What factors contribute toward the attainment of this objective?

Short headway between cars to reduce waiting time of patrons.

Quick application of brakes to reduce time consumed in making a stop.

Rapid interchange of passengers to cut down the standing time.

Prompt release of brakes to permit a quick get-away.

How may these factors be efficiently combined while retaining the basic element of safety?

The answer is—Safety Car Control Equipment. It brings economic advantages that warrant additional cars. It assures the quickest possible brake action. It provides the maximum convenience and flexibility in controlling entrance and exit. It safeguards operation by interlocking power, brakes, and doors, and by centralizing responsibility.

Safety Cars are giving a noteworthy impetus to transportation service.



SAFETY CAR DEVICES CO.
OF ST. LOUIS, MO.

Postal and Telegraphic Address:
WILMERDING, PA.

CHICAGO SAN FRANCISCO NEW YORK WASHINGTON PITTSBURGH

See our exhibit of the latest development in
Safety Car Control Equipment at the Convention, Space 108



Keeping Abreast of the Traffic Stream

HOW to speed up traffic through congested areas is a problem confronting many street railway companies today. Such a problem can be solved by a better brake—a quicker acting brake—a brake that is as effective on loaded cars as on empty cars.

The Westinghouse Variable Load Brake will better traffic conditions because—

It maintains the maximum braking ratio substantially constant throughout the range of passenger loading, by an automatic adjustment of cylinder pressure as the car weight changes.

It makes the brake action independent of main reservoir fluctuations, as the maximum cylinder pressure for a loaded car corresponds to the minimum governor setting.

It decreases the time of brake application and release, and makes possible a higher rate of retardation, because the maximum braking ratio is obtained with a lower cylinder pressure.

The uniformly short stops thus made possible are reflected in greater safety and faster service during congested periods—cars are able to keep abreast of the traffic stream.

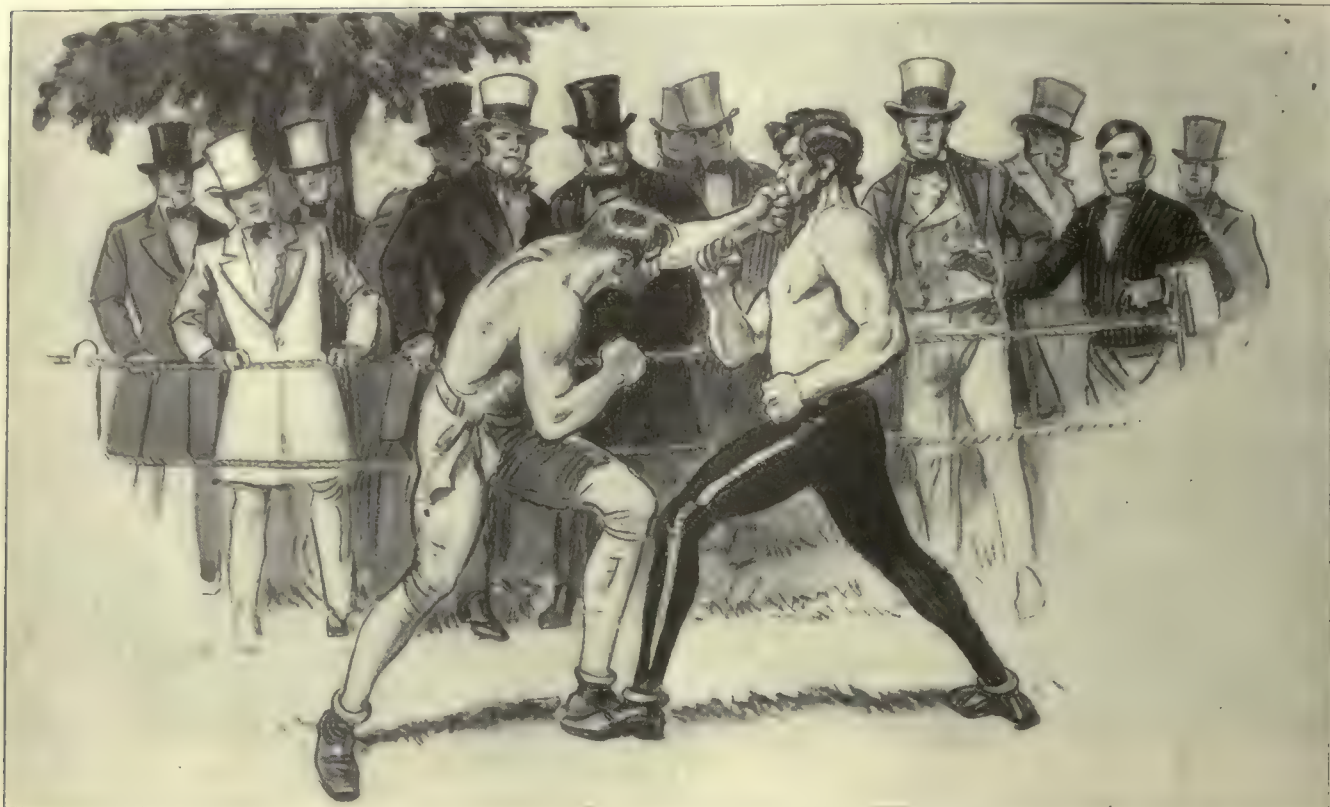
See our exhibit at the Convention—Spaces 112-114. Perhaps this brake has the potentiality for solving your transportation problem.



WESTINGHOUSE TRACTION BRAKE CO.

GENERAL OFFICES AND WORKS
WILMERDING, PA.

The Westinghouse Variable Load Brake is now being used by a score or more of traction properties on over 1500 cars.



From a print of an early English prize fight.

“The Champion” Earns His Title

TO win the title of “Champion” requires qualities superior to those possessed by ordinary men.

To earn the name of “One-Wear,” Davis Steel Wheels were required to develop qualities unknown in ordinary wheels.

They were able to do so solely because of the heat-treated special composition steel of which they are made.

Without this composition they could not rightfully be called “One-Wear” Wheels.

AMERICAN STEEL FOUNDRIES

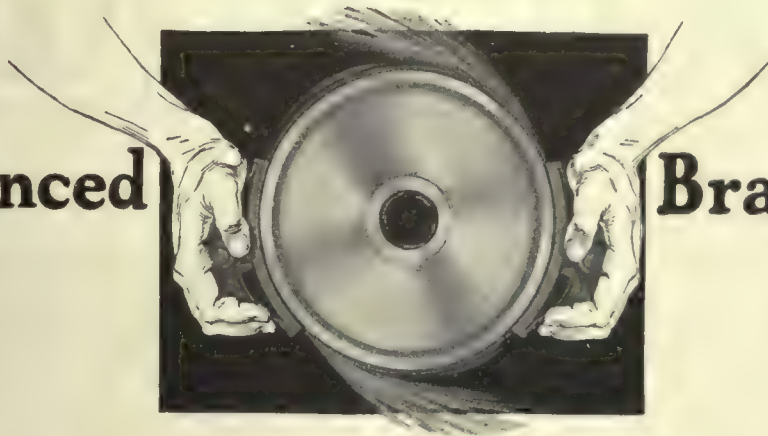
NEW YORK

CHICAGO

ST. LOUIS



Balanced



Braking

In line with modern principles

Higher rates of retardation are demanded as a part of the program of speedier suburban and street railway service. With two brake shoes per wheel instead of one, the clasp brake is admirably suited to producing maximum retarding effect, with minimum strain and wear on truck and journal parts.

Balancing the heavy braking forces on opposite sides of the wheel has many advantages

1. Less journal box wear.
2. Permits wheel to follow freely, vertical inequalities in track.
3. Makes use of flanged brake shoes practical.
4. Higher co-efficient of friction.
5. Divides energy absorption between two shoes, thus reducing heating effect from brake application.
6. Reduces frequency of brake shoe replacements on the car.

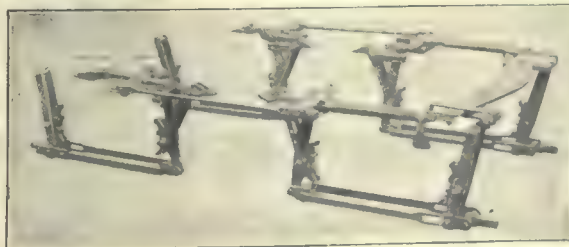
AMERICAN STEEL FOUNDRIES

NEW YORK

CHICAGO

ST. LOUIS

American Multiple Unit Clasp Brake



Practical Value

THE practical value of Elreco Tubular Steel Poles is best demonstrated by their long life and economy of installation and maintenance.

Span and trolley wires, Lighting Units and even traffic signals may be hung on a single Elreco Pole. Yet Elreco Poles are stronger, lighter in weight, more pleasing in appearance and more adaptable.

Quite obviously when three or four companies utilize the same poles the cost to each for installation and maintenance is reduced to a minimum.

Elreco Tubular Steel Poles are a four-in-one cost reducing installation—of practical value. Investigate. Address



ELECTRIC RAILWAY EQUIPMENT COMPANY

2900 Corman Ave., Cincinnati, O.

30 Church Street, New York

Mack has something for you at Cleveland

It is one thing to observe buses on the road. It is quite different to study the individual parts and assemblies spread out before you; to see for yourself the actual features that govern performance.

The Mack exhibit at Cleveland affords you such opportunity of judging for yourself the factors of quality and workmanship that alone can produce revenue-earning miles.



The
Mack

The strongest steel in the industry form—Stair's New
 model chrome-nickel steel, drop-forged.
 For performance, reliability and ability to handle stress
 nothing equals a drop-forged.
 Maximum strength in the grade of ground
 shafts: from the largest size of 8 1/2 inch
 ground shaft diameter—ground only in
 a single type side lathe cut at 45 degrees.
 Also in the Mack rear axle hubs, the
 following vital features are built
 into:

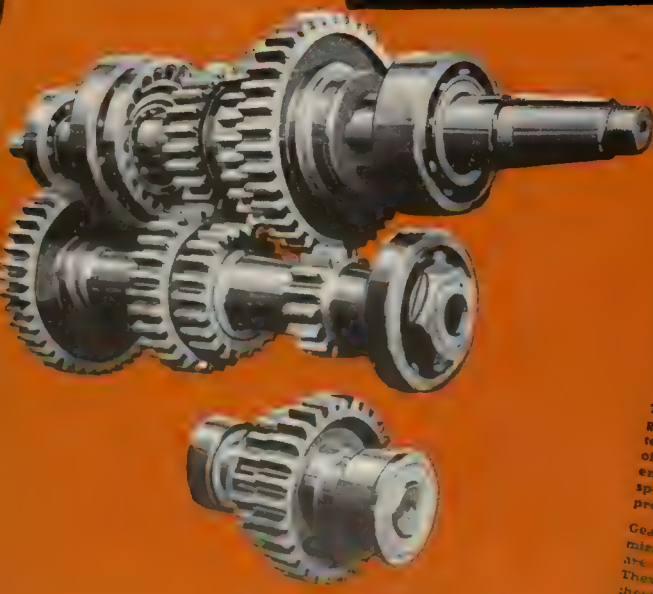
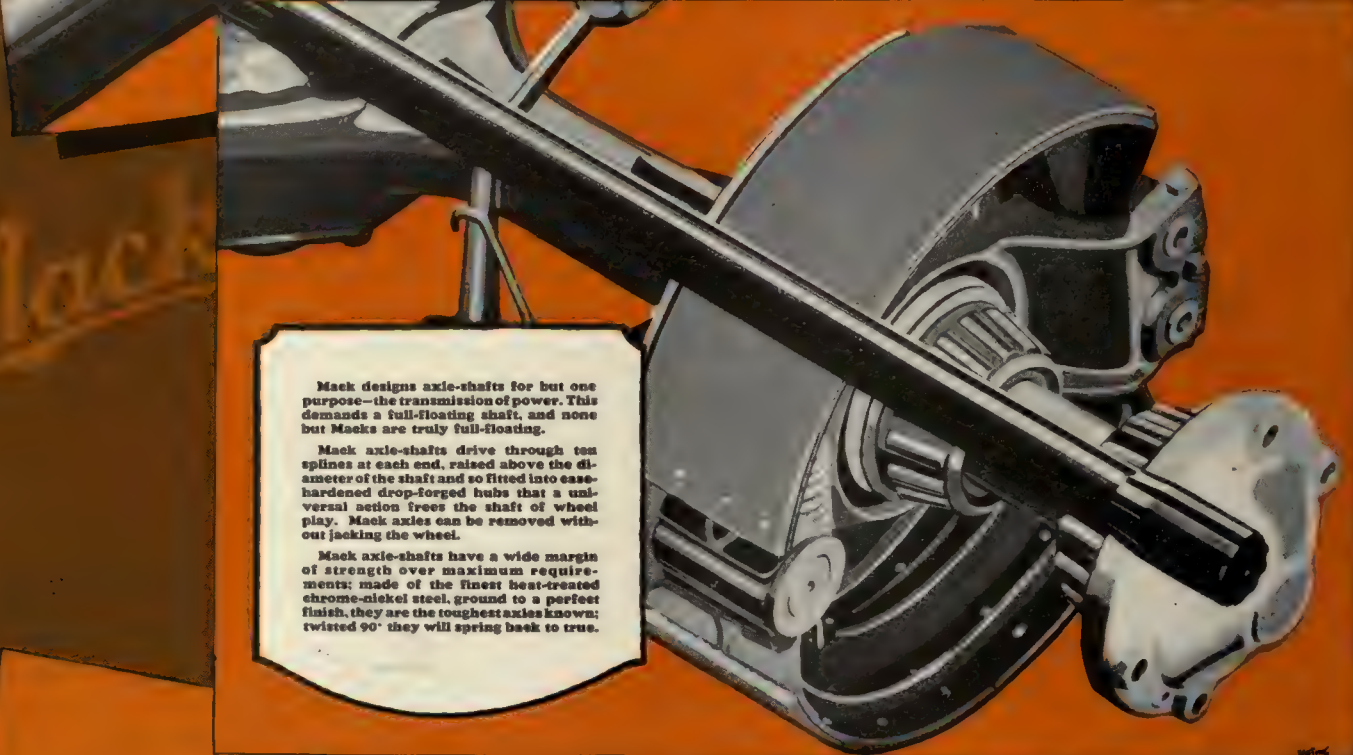
No welds, no rivets, no bolts
 joints, no stress cracks, no
 heavy, low-strength castings.
 Wheel hubs, axle beam,
 gear carrier housing,
 brake flange housing and
 spring perches all in-
 tegral.
 No wonder the Mack
 rear axle made the
 grade.



Mack designs axle-shafts for but one
 purpose—the transmission of power. This
 demands a full-floating shaft, and none
 but Macks are truly full-floating.

Mack axle-shafts drive through ten
 splines at each end, raised above the di-
 ameter of the shaft and so fitted into case-
 hardened drop-forged hubs that a uni-
 versal action frees the shaft of wheel
 play. Mack axles can be removed with-
 out jacking the wheel.

Mack axle-shafts have a wide margin
 of strength over maximum require-
 ments; made of the finest heat-treated
 chrome-nickel steel, ground to a perfect
 finish, they are the toughest axles known;
 twisted 90° they will spring back to true.



Private automobiles use their transmission
 gears but little. With trucks, noise doesn't
 bother the freight.

With a bus, it's different.

Mack secures quiet transmission gears by
 correctly guiding them on their shafts by
 generator ground surfaces; by making the
 shafts stiff and supporting them rigidly by
 large and thoroughly lubricated bearings;
 by designing them with wide faces and low
 tooth speeds; by insisting that the gears are
 metallurgically and mechanically right.

The price of correctly-meshed, true-running
 gears with truly-formed, smooth-surfaced
 teeth is pains-taking care in the manufacture
 of every part; costly processes not usually
 employed; special materials formed in
 special ways and heat-treated with scientific
 precision.

Gear teeth finished by generator grinding to
 mirror smoothness and perfection of form
 are typical of the Mack. They roll quietly.
 These are silent gears. They continue to hold
 their advantages indefinitely in the sever-
 est service.

**The first 100,
 miles tell the story**

**Were they pro-
 able miles? Are th-
 more economic m-
 left?**

**Profitable mi-
 are assured by
 Mack-built parts u-
 in Mack buses.**

durability is more than strength. It calls for a hard bearing surface. It requires large bearing areas. Ordinary heat-treatment makes small shafts strong. That is all. Sufficient case hardening for durability can not be had without making the entire shaft too brittle to stand the shocks.

Small shafts lack rigidity and bearing area. Mack shafts are big enough to bear the shocks of starting. This means longer life. This means less wear on your touch case. Integral forged counterweights permit vibrationless dynamic balance.



Quietness in timing gears is one thing. Durability and accuracy are another matter. Ordinary timing gears are made quiet at the expense of long life and correct timing. The combination of durability, accuracy and silence has baffled motor manufacturers for a generation.

Cast iron gears, non-metallic gears and silent chains are all quiet, but none of them are durable. When wear takes place, inaccurate timing results and that means irregular running and loss of engine power. Replacements are troublesome and expensive.

Ordinary steel gears are relatively long lived and accurate; but incurably noisy.

The perfect timing drive is none of these! It is made of steel end-grained upset drop-forgings. The teeth are cut helical and case-hardened. That means everlasting durability and unvarying accuracy. Finally, the teeth are generated ground and as a result roll silently.

These features are combined in Mack timing gears alone. There can be no imitations because Mack not only designed, patented and built the machine which will generator grind helical teeth, but uses them exclusively.

All these can be seen and examined at the Mack Booth. To inspect them should be a part of your Convention Program. They prove the reasons for Mack performance.

Low tooth pressures characterize Mack gears. Wide tooth faces and perfect meshing are responsible. Mack reliability follows.

Minimum friction—reduced power losses—negligible gear wear and strain.

But! Wide gears must be cut accurately to insure perfect form and straightness essential to running and retaining accurate mesh the entire width.

Mack precision production—Mack design—Mack materials achieve these essentials in correct gear engineering.



Traction Lines Know By Experience That Mack Miles Are Profitable Miles

Hours on the road are the ones that count.

Forty-eight per cent of all the electric traction companies operating buses have Macks in their fleets.

They are securing the benefits of Mack's 27 years' engineering and manufacturing experience plus available operators' data covering maintenance cost and shop hour records. Here are just a few of the electric traction companies that use Mack—

Boston Elevated Railway, Boston, Mass.
Boston & Worcester St. Ry., Framingham, Mass.
The Connecticut Co., New Haven, Conn.
United Electric Railway, Providence, R. I.
Springfield Street Railway, Springfield, Mass.
New York, Westchester & Boston St. Ry., New York, N. Y.
Third Avenue Railway, New York, N. Y.
New Jersey Public Service Corp., Newark, N. J.
Washington Rapid Transit Co., Washington, D. C.
Lehigh Traction Co., Hazleton, Pa.
Lehigh Valley Transit Co., Allentown, Pa.
United Railways & Electric Co., Baltimore, Md.
Toronto Transportation Commission, Toronto, Canada
Northern Ohio Power & Light Co., Akron, Ohio
New York State Railways, Rochester, N. Y.
United Traction Co., Albany, N. Y.
Cincinnati Street Railway, Cincinnati, Ohio
Illinois Power & Light Corp., Chicago, Ill.
Twin City Rapid Transit Co., St. Paul, Minn.
Oklahoma Union Railway, Tulsa, Okla.
Illinois Power Co., Springfield, Ill.
Iowa Southern Utilities Co., Centerville, Ia.
Community Traction Co., Toledo, Ohio
Virginia Electric & Power Co., Richmond, Va.
Key West Electric Co., Key West, Fla.
Tampa Electric Co., Tampa, Fla.
New Orleans Public Service, New Orleans, La.
Florida Motor Lines, (Stone & Webster), Tampa, Fla.
Los Angeles Railway, Los Angeles, Cal.
Municipal Railway of San Francisco, San Francisco, Cal.
Portland Electric Power Co., Portland, Ore.
Tacoma Ry. & Power Co., Tacoma, Wash.
Eugene Street Railway, Eugene, Ore.

Ask representatives of these companies at the Convention what their experience has been. Their answer will help you to decide.

Mack Trucks, Inc.
International Motor Company
25 Broadway, New York City

The added decade in pole and tie service

THE use of creosoted southern yellow pine for poles and ties ordinarily adds a decade or more to the life obtained from other timber.

Adding this decade to timber life subtracts thousands of dollars from annual cost.

The Georgia Power Co., using a great deal of Amcreco Creosoted Southern Yellow Pine, has cut annual cost on ties,

\$290.40 per mile in open track.

\$528.00 per mile in track under \$1.00 a sq. yd. pavement.

\$1188.00 per mile in track under \$3.50 a sq.yd. pavement.

On poles, \$281.98 per mile of line was saved.

The A. T. & T. Co.'s Norfolk-Washington line built with creosoted pine poles 30 years ago is still in "good-as-new" condition and one of their Texas lines has been in service 29 years with only 10 per cent replacements. The Public Service Co. of New Jersey reports creosoted pine poles in service 32 years and "good" yet, and the Louisville Railway Company has replaced none of the creosoted pine poles put in 22 years ago. In New Orleans the tearing up of street railways found creosoted pine ties 14 years old in perfect condition. They were stored for future use.

Amcreco plants are located at points selected to serve your needs most promptly and at lowest cost. Write for quotations.



SALES OFFICES

332 So. Michigan Ave.
Chicago

350 Madison Ave.
New York City

401 W. Main St.
Louisville, Ky.

Brunswick, Ga.
Bogalusa, La.

AMERICAN CREOSOTING COMPANY

COLONIAL
CREOSOTING
COMPANY
INCORPORATED



GEORGIA
CREOSOTING
COMPANY
INCORPORATED

LOUISVILLE - KENTUCKY

REJ 9-17870

Up-to-date service re



Golden Glow Headlights

Though projecting powerful and well concentrated beams of light, the greenish-yellow glass reflector eliminates any glaring and dazzling effect by absorbing the violet and blue rays. This glass reflector will not scratch, tarnish or corrode. Golden Glow Headlights are made in various styles and sizes to suit every requirement. Provide this safety for your passengers and your equipment.



Pullman Type



Safety Type

Keystone Lighting Fixtures

The bright, steady, well-diffused light provided by these lighting fixtures is a practical necessity in well equipped cars. Manufactured to the Keystone standard of quality, these lighting fixtures are both ornamental and durable. They add attractiveness and increase patronage.



Keystone Trolley Catchers

Mechanically sound design and construction enables these ever-reliable catchers to catch the trolley an instant after it leaves the wire. This saves considerable wear and tear on the overhead system as well as the time and expense required for repairs and delays in service.



Keystone Rotary Gongs

Designed for giving at a slight pressure of the foot from one to fifteen strokes—regulated at the will of the operator. This loud and distinct alarm provides an effective warning even in noisy surroundings. Such gongs are merely common-sense protection for equipment and passengers in congested and noisy traffic.



KEYSTONE

requires modern equipment!



Hunter-Keystone Destination Signs

"Tell the public where you're going" with these clear, clean, readable signs. Bold white letters on black roller curtains make for high visibility by day and by night. They advertise your service and establish your routes.



Faraday Car Signals

The installation of these reliable and convenient passenger signal systems enables passengers to signal the operator without commotion and distraction of his attention. Made for every requirement—high or low voltage systems, buzzers, vibrating bells or single-stroke bells, resistance panels, flush or surface type push buttons. A convenience your passengers appreciate.



Keystone Gear Cases

Made of soft, open-hearth, deep-drawing steel—tough enough to protect the gear and pinion body and to absorb vibration—yet flexible enough to prevent serious accident. Both riveted and spot welded. Halves of any given type are interchangeable.



See our exhibit Space 139

Other important items in
Catalog No. 7

Motormen's Seats
Line Material
Employees' Badges
Portable Lamp Guards
Air Sanders
Fare Registers
Trolley Harps and Wheels
Pinion Pullers
Insulating Material, etc.



Ask for a copy
of Catalog No. 7

ELECTRIC SERVICE SUPPLIES Co.

Manufacturers

PHILADELPHIA
17th and Cambria Sts.

NEW YORK
50 Church St.

CHICAGO
Illinois Merchants'
Bank Bldg.

PITTSBURGH BOSTON SCRANTON DETROIT
Bessemer Building 88 Broad St. 216 N. Washington Ave. General Motors Bldg.
Lyman Tube & Supply Co. Ltd. Montreal Toronto Vancouver

CAR EQUIPMENT



Motorman's and baggage compartment of new Cincinnati, Hamilton & Dayton interurban cars. Note small platform space occupied by the "Peacock" Staffless Brake.



The
Peacock
Staffless



A.E.R.A. Convention Booth No. 685



High speed, passenger comfort and safety were sought in the design of these interurban cars for the C., H. & D.
Built by G. C. Kuhlman Car Co.

"Peacock" Staffless Brakes

Reg. U. S. Pat. Off.

Standard of the Electric Railways!

In every type of electric railway service "Peacock" Staffless Brakes are standard. Look over the specifications of all modern cars. In nearly every case you will find included "Peacock Staffless" as the hand brake choice.

One of the latest roads to standardize on "Peacock" Brakes is the Cincinnati, Hamilton & Dayton Railway Company, of Dayton, Ohio. In the complete reorganization of this property all new modern steel cars were placed in service on both interurban and city lines. The Chilean Electric Tramway & Light Co., Santiago, has also standardized on "Peacock" Staffless Brakes.

Visit our Booth at the Cleveland Convention and let us tell you why "Peacock" Staffless Brakes are the choice of the Electric Railways,—or we will be pleased to mail the information upon request.

National Brake Company, Inc.

890 Ellicott Square, Buffalo, N. Y.

Canadian Representative:

Lyman Tube & Supply Co., Ltd., Montreal, Can.

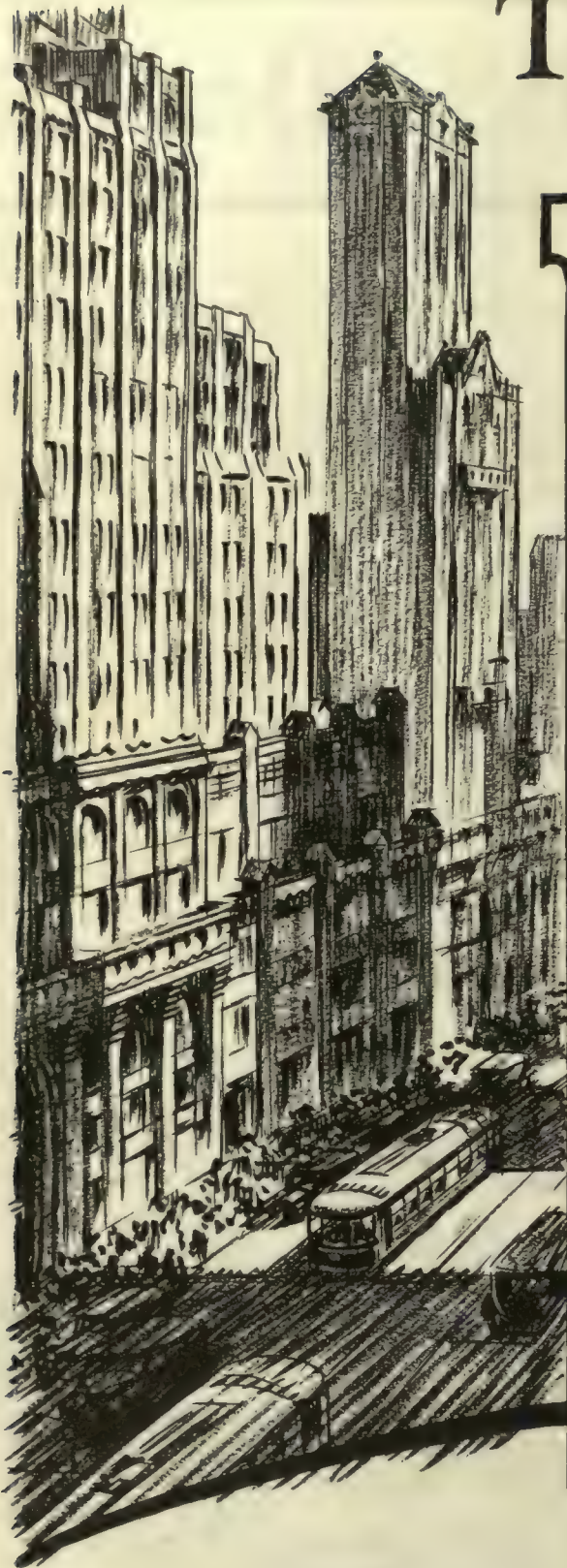


Front platform of new Chilean Electric Tramway & Light Co., Santiago, Chile, cars. Note the "Peacock" Staffless Brakes.



Every modern improvement and safety device is incorporated in the new Santiago cars. Built by J. G. Brill Co.

The job now is t



Our Latest Development **The Nuttall Aluminum Trolley Base**

The Aluminum Trolley Base is the latest Nuttall development for reducing costs in the Electric Railway Industry. This base is the lightest one we have ever built, it weighs but *67 pounds*. It has all the features of our now famous US2OA base; Timken roller bearings; hardened steel wearing parts; current shunted around bearings and axle pin; and once in six months lubrication.

See this base at our booth at
the A. E. R. A. Con-
vention.

Keep in step with progress

Operators with an eye to
the future are installing

Nuttall

Standard Helical Gears

Up-to-date service with up-to-date equipment has well proved its money making possibilities. And not a few of the country's electric railways have already seen their first year under the new regime go past.

Now is the time to see that there is no slacking off.

Operators with an eye to future demands on service standards and facilities are installing Nuttall Standard Helical Gears. Not only have they seen it proved that these gears will give them about 400% longer wear than untreated cast steel. But they make it a "selling point" that Nuttall Helical Gear equipped cars run more smoothly, are free from vibration and make but little noise.

If you are thinking of buying new cars for service during the competitive years ahead, or even if you are compelled to make the best of old equipment it will be well worth your while to have our engineers explain the helical gear question thoroughly—either by mail or at the Convention.

Nuttall

CONVENTION
EXHIBIT
BOOTH 110

LOST

Many hours of operating time in painting cars. Suitable reward for preventing further loss of this time. Progressive Transportation Co.

No More Lost Hours in Painting Your Cars!

If you have any finishing problems write to Valentine & Company, 456 Fourth Ave., New York City.



It may sound too good to be true, but "lost hours" due to painting are no longer necessary.

By the use of a carefully planned time schedule and Nitro-Valspar, every coat of which is fast-drying lacquer — cars may be completely refinished outside of scheduled running time.

Valentine & Company will gladly cooperate with executives of car operating companies that do their own refinishing, and who wish to reduce to a minimum those hours now lost in refinishing.

NITRO-VALSPAR

The Valentine Lacquer Finish



Track-Roadway and Line Material

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American Electrical Works
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Metal & Thermit Corp.

Nachod & United States Signal Co.
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Okonite Co., The
Okonite-Callendar Cable Co., Inc., The

Rail Joint Co.
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Roebbling's Sons Co., John A.
Roller-Smith Co.
Russell, Burdsall & Ward Bolt & Nut Co.

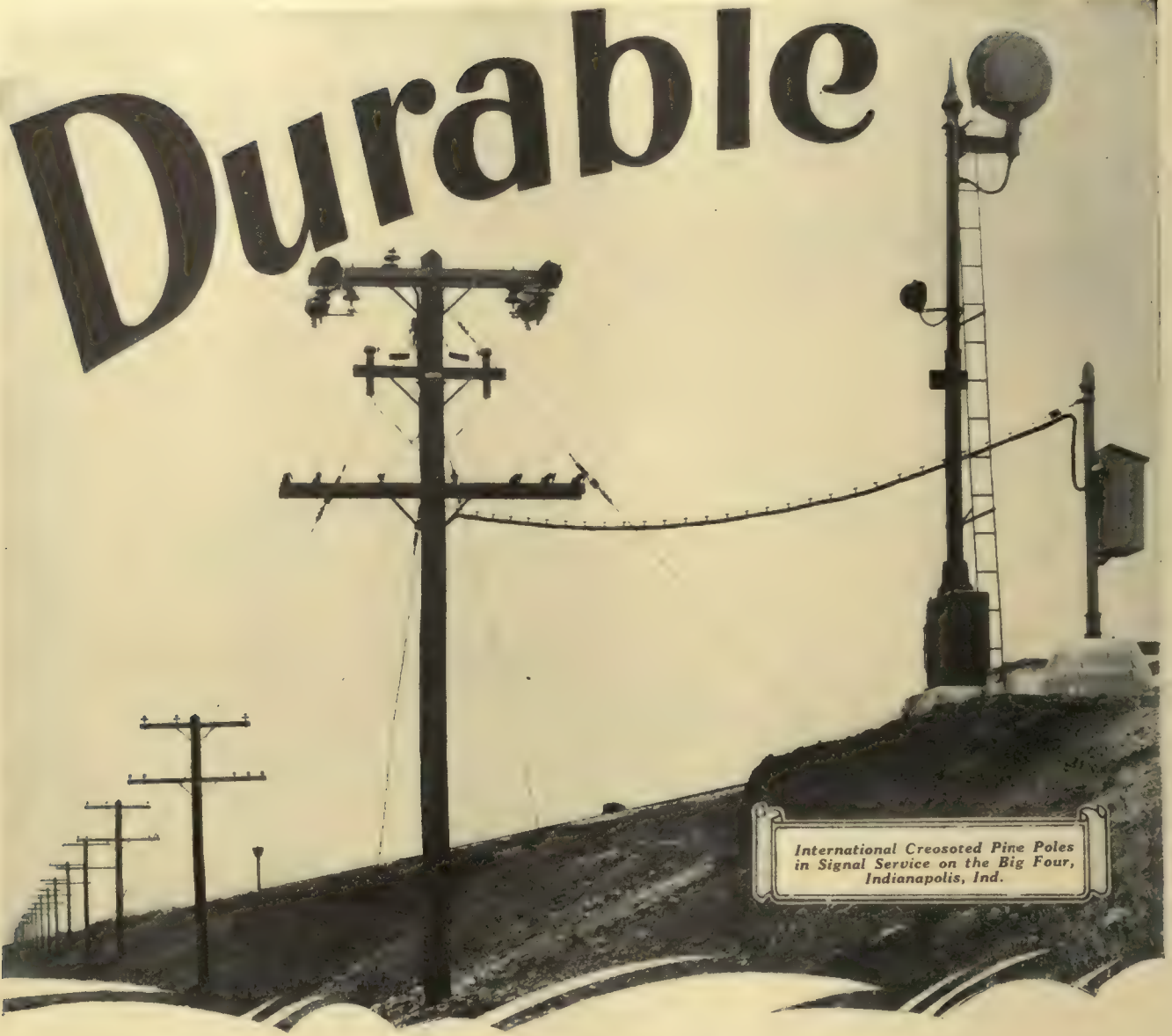
Serviced Products Co., R. P.
Sullivan Machinery Co.

Truscon Steel Co.

Una Welding & Bonding Co.
Union Metals Co.

Wharton, Jr. & Co., Wm.
Wood Co., Chas. N.

Durable



*International Creosoted Pine Poles
in Signal Service on the Big Four,
Indianapolis, Ind.*

Creosoting Prevents the Decay That Destroys Poles

International Creosoted Poles give long and dependable service because the pine pole is the strongest of the pole woods, and because that strength is made lasting by preservative treatment. Take increment borings of your creosoted poles. Notice the depth of creosote penetration. The cell structure of pine wood is such that creosote penetrates deeply; and the effectiveness of preservative treatment is directly proportional to the depth of penetration.

The creosote oil is injected under pressure the full length of the pole, far into the wood fibre and beyond the possible depth of abrasions and season checks. By this method all the causes of pole decay are eliminated.

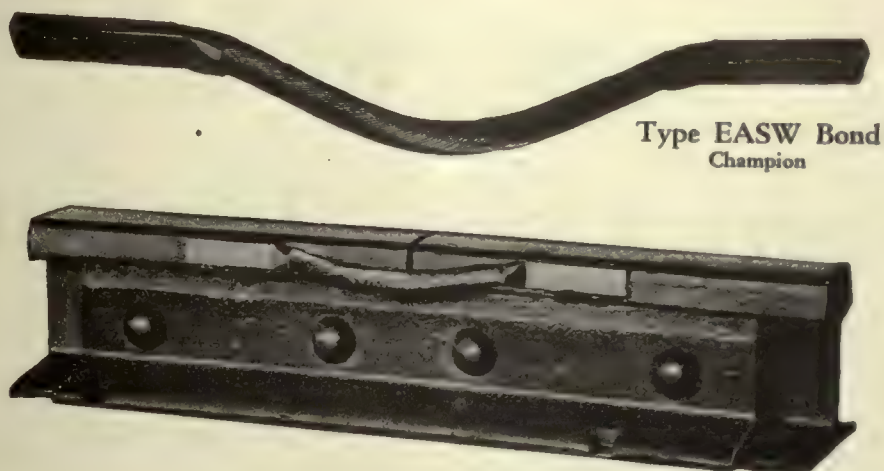
The economic benefits derived can be readily realized by the fact that *International* Creosoted Poles have given 28 years of service and are still perfectly sound in territories where other poles have failed completely in eight to eleven years.

International Creosoting and Construction Co.
General Office—Galveston, Texas

International

Creosoted Yellow Pine Poles





Type EASW Bond
Champion

Meeting the Demand for Better Transportation

City and suburban electric railways are making memorable progress in the direction of better transportation. As ever, it is of continued importance that your track return circuit be kept at top notch efficiency. When power is poor, cars lag, pickup is slow and schedules are disrupted.

Type EASW brazed bonds, champion type, have successfully met the exacting conditions of large and small railways. Once applied, these bonds give lasting, trouble free service. Maintenance bonding is a minimum.



Champion type bonds are provided with a terminal made from copper, so shaped that rail vibrations do not affect the conductor wires. Using the portable welding furnace, application of brazed bonds is practically automatic. The heat of application is so low that no injury is done to the bond or rail. The strength of the union makes it impossible for the terminal to become detached. Since steel rail averages only about one eighth as conductive as copper, the contact area with the rail is made eight times the conductor area. Thus each bond will test its maximum efficiency—your track return is bound to be good.

At the AERA Convention, Spaces 319, 321 and 323.

"COMPLETE RAIL BONDING SERVICE"

The Electric Railway Improvement Co.

2070 E61 Place

Cleveland, Ohio

NEW Beauty, Utility, Economy

WHILE Union Metal Heavy Duty Fluted Steel Poles bring new beauty to the curb line, this is not the only point which recommends their use for all types of line construction. Their superior appearance, of course, is an outstanding feature for building good will; but in addition they provide superior utility and economy.

Union Metal Poles, because of their new type of construction, provide greater strength and flexibility in all directions and at the same time are lighter in weight and have a lower center of gravity. Moreover, because of their exclusive ventilated construction and cadmium coating, the hazard of ground line corrosion has been practically eliminated.

The anchor rod construction brings new ease and speed to the work of erecting the poles, applying the load and lining up the poles with load applied. These advantages spell real overhead economies.

Another economy is presented by the fact that all poles are constructed to meet the individual requirements of the particular job, thereby providing a support ample in its strength and yet not weighed down with surplus bulk which only causes undue shipping and erecting expense.

*See the complete display at the A. E. R. A. Convention, Cleveland
— Space 619 West Wing and between tracks E, F and G.*

THE UNION METAL MANUFACTURING CO.

General Offices and Factory, Canton, Ohio

*Branches — New York, Chicago, Philadelphia, Cleveland,
Pittsburgh, St. Louis, San Francisco, Los Angeles, Jacksonville.*

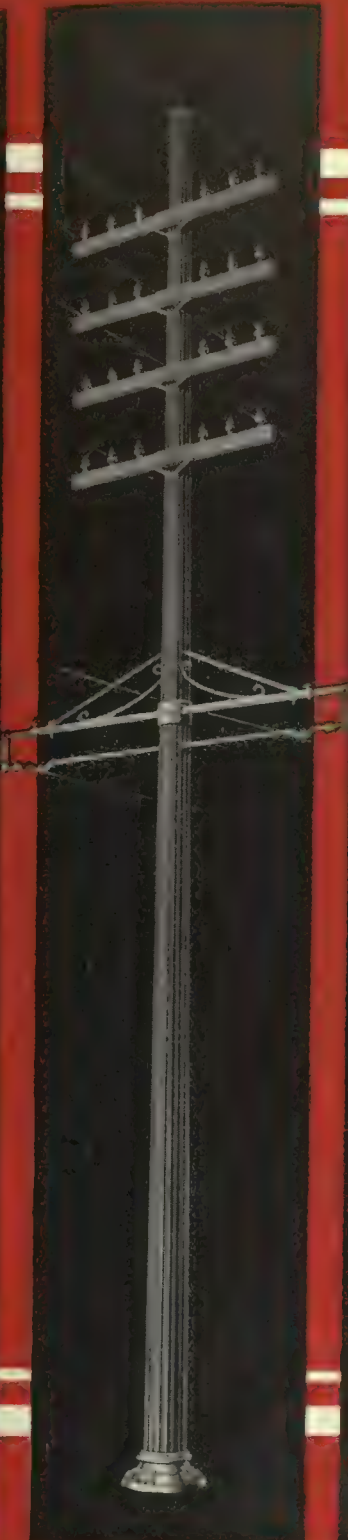
UNION METAL



FLUTED STEEL PRODUCTS



Union Metal Heavy Duty Fluted Steel Pole, as used for transmission lines.



Often Union Metal Heavy Duty Poles may be used both for transmission and trolley wire support.



An artistic highly ornamental pole for trolley span wire support.

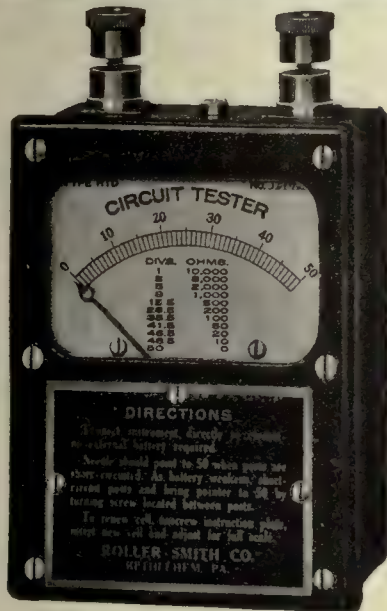


Illustrating how Union Metal Poles can reduce the number of poles along the curb line with real beauty and utility.

1 ton or 1000

RAILS

L·B·FOSTER COMPANY
PITTSBURGH NEW YORK CHICAGO



Three ROLLER-SMITH Instruments of interest to every Electric Railway Man

R-S Rail Bond Testers

are known and used all over the world. They are the standard with which all others are compared.

The Type SBT is recommended for all ordinary work and the super-sensitive Type BBT for conditions where there is little or no current in the rail. Bulletin G-200 should be in the hands of every man who is interested in bond testing. Send for your copy. Use the coupon.

New Type HTD Circuit Tester

The new Type HTD Circuit Tester is the instrument that everyone has been waiting for. With it one can instantly locate open circuits in coils and circuits of all kinds. It shows directly the approximate resistance of the coil or circuit up to a range of 10,000 ohms. It is small, compact, rugged and thoroughly dependable. The small, standard flash-light cell is self-contained. The price is very low for such an instrument. The many other features of interest are given in new Supplement No. 1 to Bulletin No. G-300. Send for your copy. Use the coupon.

New Type COM Ohmmeter

The COM Portable Ohmmeter is direct reading, accurate and entirely self-contained. Measures resistance values from .5 ohm to 50,000 ohms. The price is right. Send for new Supplement No. 1 to Bulletin No. G-300. Use the coupon.

"Over thirty years' experience is back of ROLLER-SMITH"

ROLLER-SMITH COMPANY

Electrical Measuring and Protective Apparatus

Main Office:
2140 Woolworth Bldg.,
NEW YORK



Works:
Bethlehem, Pennsyl-
vania

Offices in principal cities in U. S. A. and Canada
Representatives in Australia, Cuba and Japan

Roller-Smith Co., 2140 Woolworth Bldg., New York City

Gentlemen: Please send me: Supplement to G-300 ☐ Bulletin G-200 ☐
(Check one or both).

Name.....

Position.....

Address.....

City.....

State.....

25

Years Experience

Hubbard Line Hardware

To use Hubbard Pole Line Hardware and Peirce Construction Specialties is to obtain the advantages of Hubbard's twenty-five years experience in the electric railway field coordinated with four modern plants.

It is therefore only natural that Hubbard Standard Pole Line Hardware and Peirce Construction Specialties fully meet every requirement of the modern electric railway.

In addition to this regular service you may call on our engineering department to assist in solving any special problems of design or construction.

For excellence of quality and economy of time, select all your pole-line hardware from the concentrated buying guide of the Electric Railway Industry—*The Hubbard Catalog*.

N. B. This advertisement is to acquaint you further with Hubbard coordinated service consisting of 4 modern plants, 170 responsible jobbers and 25 years experience in serving the electric railway industry.

Write us for a copy of Hubbard Catalog

The **HARDWARE**
makes the line



Hubbard
makes the **HARDWARE**



Hubbard Heavy Rolled
Steel Guy Clamps



Peirce Forged
Steel Pins



Peirce-Pins



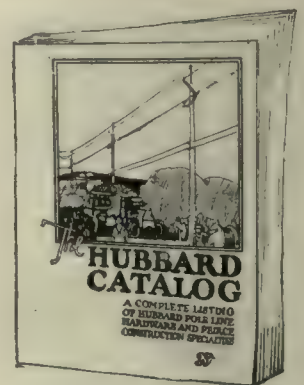
Hubbard
Turnbuckles



Split Pole Bands

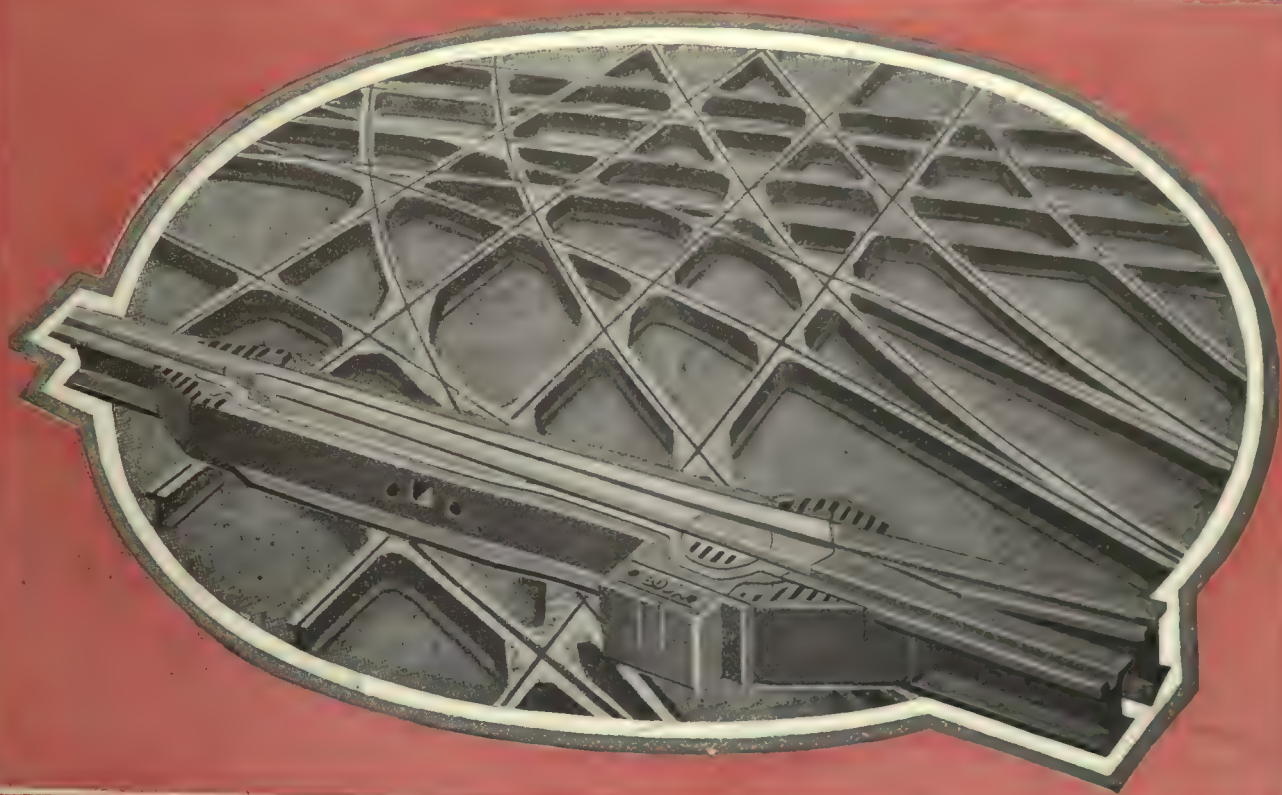


Hubbard Pole Bands
With Pull-off Rods



Hubbard and COMPANY

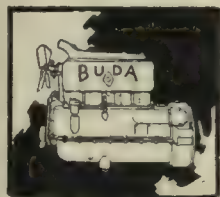
PITTSBURGH • OAKLAND, CAL. • CHICAGO



Track and Bonding Drill



Track Jack



Bus Engines

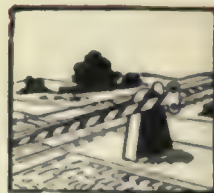


Motor Car

SERVICE is the one unfailing test of quality in trackwork. It is a test that Buda trackwork will meet—and has been meeting for forty-six years. The name Buda is your assurance of the highest quality.

SEND US YOUR INQUIRIES

THE BUDA COMPANY
HARVEY (Chicago Suburb), ILL.

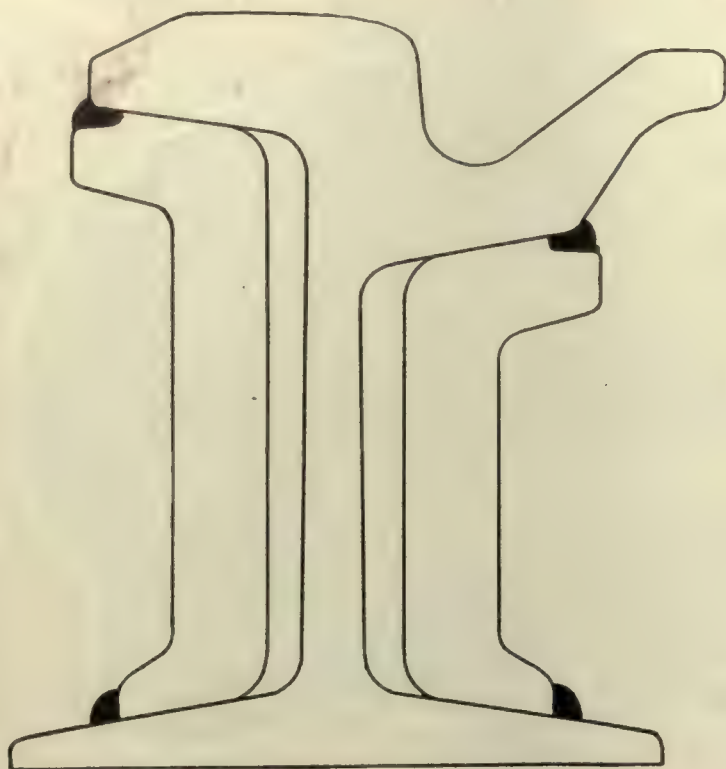


Crossing Gates



Buda Hubron Earth Drill

On the BUDA HUBRON Earth Drill some companies report cutting their pole hole digging to 1/6 their former cost by hand.



“Weld Plates”

*Try them and
profit*

After all, the value of Weld Plates is easily and positively determined. Try a few. Test them on the line and abide by the result.

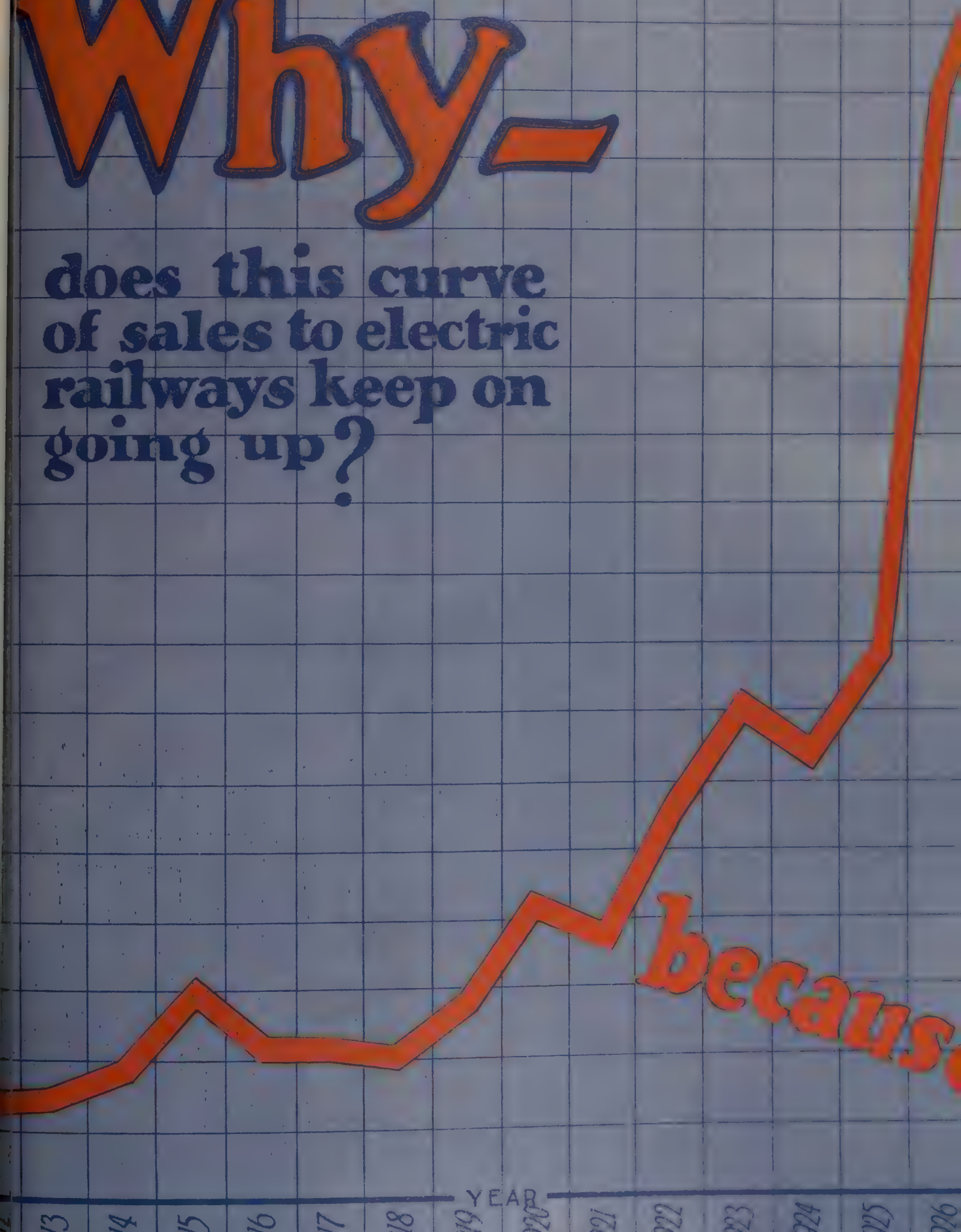
The great number now in service is warrant enough for a test. They represent the most modern Welding practice. They are rolled especially for electric welded joints. Study the accompanying illustration. Note the shape, the grooves which retain plenty of weld material along the upper edges, the wide top and bottom contact areas and the suitability for the use of short bolts.

THE RAIL JOINT COMPANY

165 Broadway, New York

Why-

does this curve
of sales to electric
railways keep on
going up?



-in **Thermit Welding** electric rail up-to-date method of track construction

A prediction—



—and its fulfillment

In an advertisement in January, 1927, we predicted that a new altitude record in the sales curve of Thermit would be established.

This prediction has already been fulfilled! For the first eight months of 1927, ending August 31, the sales of Thermit to electric railways exceeded the total sales for the full year 1926!

Thermit in Brooklyn

**When your Engineer says—
“Thermit weld”**

Let Thermit help unload this burden

You can use lighter rail!

Thermit—such perfect

METAL & THERMIT CORPORATION
NEW YORK, N.Y.
320 BROADWAY

1912 1913 1914 1915 1916 1917 1918 1919

ways have found the tion and maintenance!

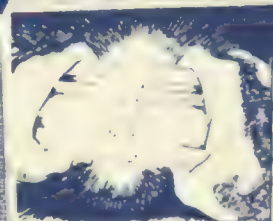
Thermit insert rail welds have made steady progress since they were first put on the market in 1912. Thermit welds, installed fifteen years ago, and under heavy traffic ever since, are still good.

Today the majority of American electric railways use them especially those properties which have been most conspicuous in adopting modernization programs.

Relief
from Paving
Burdens



THYMIT
CORPORATION



Joined—not jointed!



Not so good.

Thermit—
so easy to install!

Noted for noiselessness—
European city tracks
American carriers and
current tracks the smooth
—electric railways

When your Engineer Says:
"USE LIGHTER RAIL!"
He knows THERMIT WELDING
will make it practical

What do rail joints cost?
First cost is only
one consideration



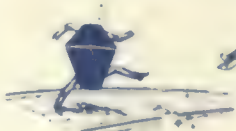
Installed 1912
The maintenance man

Get the track
ready for those
modern cars
THERMIT-WELD
this spring

Millions of
modern cars
and
at least a
thousand
for modern
track to run
them on



"The first cost is the last cost"



Beat it—Dutchman!

THERMIT WELDS

When your En
"Therm
it on sound
engineering p

THERMIT CORP
120 BROADWAY, NEW YORK, N.Y.

METAL & THERMIT CORPORATION

METAL & THERMIT CORPORATION
120 BROADWAY, NEW YORK, N.Y.

METAL & THERMIT CORPORATION
120 BROADWAY, NEW YORK, N.Y.

THERMIT WELDS

THYMIT



Don't Patch It—

Electric railways have a lot of joints like the upper left illustration—rail ends cupped—angle bars worn and bent—paving in bad shape at these joints.

Thermit welding is the remedy! At a cost slightly in excess of patching, the result is old track as good as new!

Visit the
CONVENTION
EXHIBIT
SPACE

Booth 244

Track Spaces, 309-311



Thermit Weld It!

Figure yourself what you can save by using Thermit Insert Rail Welds! Here are some of the money-saving advantages:

- Prolongs the life of track.
- Reduces depreciation of cars.
- Saves the paving around the joints.
- Lighter rail can be used.
- No electrical bonding needed.
- and the first cost is the last cost!

Thermit costs no more, but gives a far superior result. It's time to try it out—if you're not already among the list of Thermit users.



METAL & THERMIT CORPORATION
120 BROADWAY, NEW YORK, N. Y.

Pittsburgh

Chicago

Boston

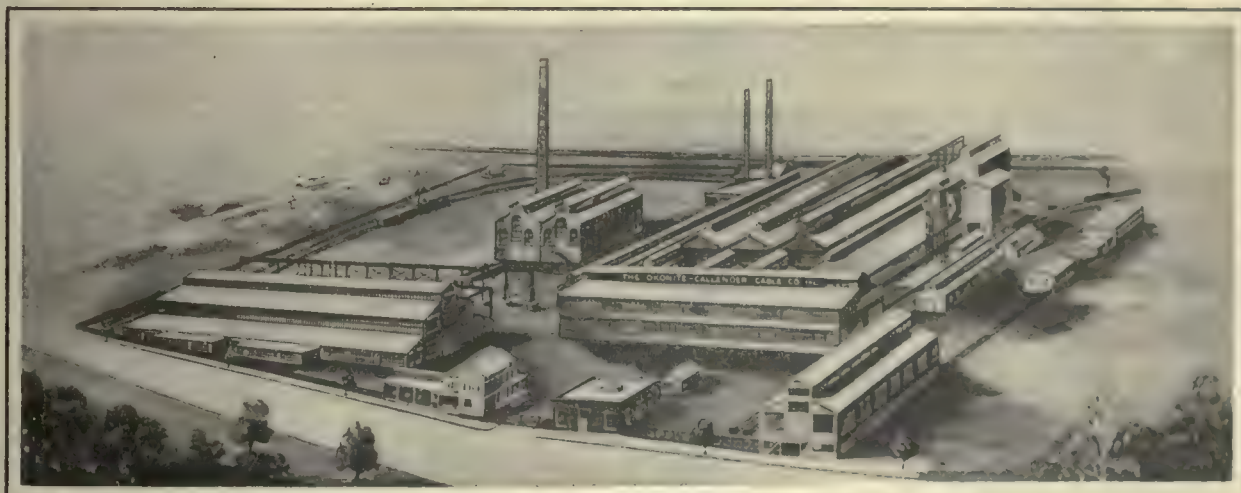
South San Francisco

Toronto

PLANTS of THE OKONITE COMPANY *AND* THE OKONITE-CALLENDER CABLE CO. INC.



THE OKONITE COMPANY, PASSAIC, N. J.



THE OKONITE-CALLENDER CABLE CO., INC., PATERSON, N. J.

OKONITE PRODUCTS

Okonite Insulated Wires & Cables • Varnished Cambric Cables • Okonite Insulating Tape
Okonite Cement • Manson & Dundee Friction Tapes • Okocord • Okoloom

OKONITE-CALLENDER PRODUCTS

Impregnated Paper Cables • Super-Tension Cables • Splicing Materials

Our Handbook "Insulated Wire & Cable" and other Publications on Request

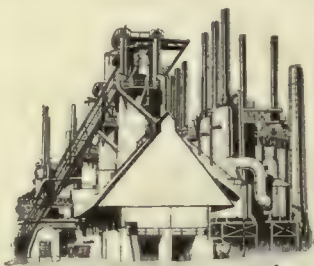
SALES OFFICES:

New York • Chicago • Pittsburgh • St. Louis • Atlanta • Birmingham • San Francisco • Los Angeles • Seattle

Pettingell-Andrews Co., Boston, Mass. Novelty Electric Co., Phila., Pa.
F. D. Lawrence Electric Co., Cincinnati, O.

Canadian Representatives: Engineering Materials Limited, Montreal
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SERVING ELECTRIC

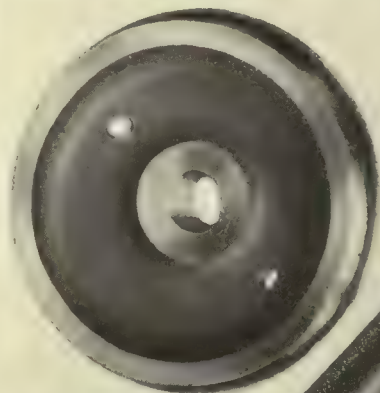
*Railbound Manganese
Hard Center Tongue
Switch, Design 909*



Quality— Durability

Our Service to Railroads covers a period of more than fifty years.

With every modern manufacturing facility for prompt fulfillment of orders and with unified control over raw materials and manufacturing processes, Bethlehem offers to the Electric Railway field products of utmost durability and satisfaction.



*Cambria Rolled
Steel Electric Car
Wheel*



*Forged Steel
Electric Car Axle*



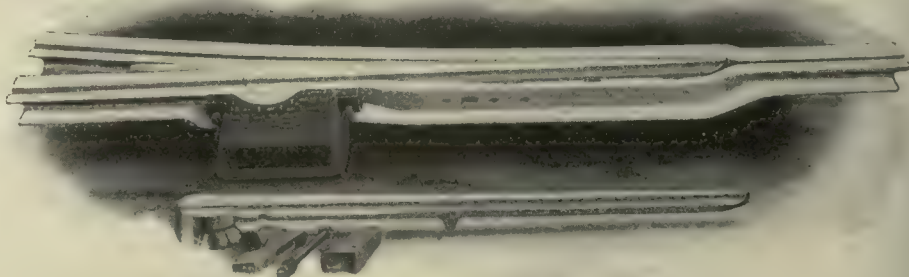
*Parallel Throw Switch Stana
Model 1222
4 3/4-in. high.*



Gold Medals awarded Bethlehem Steel Company at the recent Sesqui-Centennial Exposition at Philadelphia for railroad products is an attestation of the excellence of Bethlehem products.



*Bethlehem Special
Welding Plate,
Design 407 B*



Solid Manganese Tongue Switch, Design 905

BETHLEHEM

TRIC RAILWAYS . .

Bethlehem Products for Electric Railways

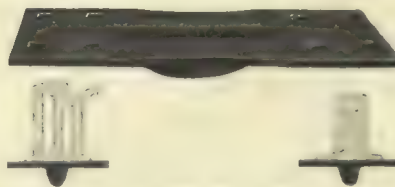
Special Trackwork
Tee and Girder Rails
Special Splice Bars for Welding
Machine Fitted Joints
Abbott and Center Rib Base Plates
Tie Rods
Bolts
Pole Line Material
Rolled Steel Wheels and Forged Axles
Rolled Steel Motor Truck Wheels
Gears
Pinions
Armature Shafts
Alloy and Tool Steels

Catalogs sent on request

*Visit our display
at the
AERA Exhibit
Cleveland, Ohio
Booths
246-252*



Abbot Base Plate



Center Rib Base Plate



*Railbound Manganese
Hard Center Mate.
Design 526*

Special Trackwork and Layouts

BETHLEHEM STEEL COMPANY, General Offices: BETHLEHEM, PA.

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New York
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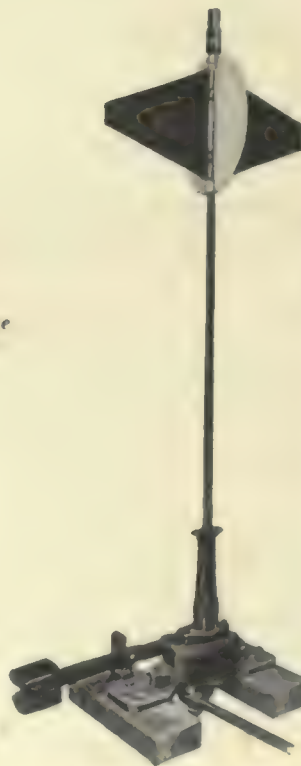
Baltimore
Chicago
Washington

St. Louis
Atlanta
San Francisco

Pittsburgh
Los Angeles
Buffalo

Seattle
Portland

Bethlehem Steel Export Corporation, 25 Broadway, New York City.
Sole Exporter of our Commercial Products



*New Century Switch Stand
Model 51-B*

BETHLEHEM

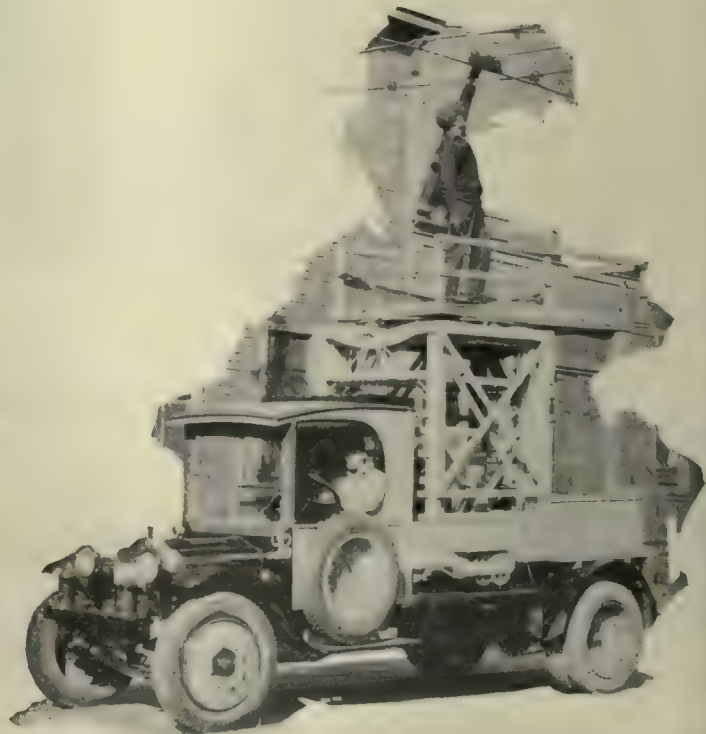
TRENTON TOWER TRUCK

PROGRESSIVE electric railway companies have long looked to Trenton Utility Towers for the safest, fastest and most practical method of bringing overhead construction within working range. They use either electric or gas trucks with Trenton Towers built to meet their particular requirements.

You, too, will find Trenton Towers indispensable for the rapid repairing of pole top equipment, conductors, braces, trolley wires, and in painting and preservative work.

Trenton Towers are always economical to operate and provide safe, easy working conditions for line men.

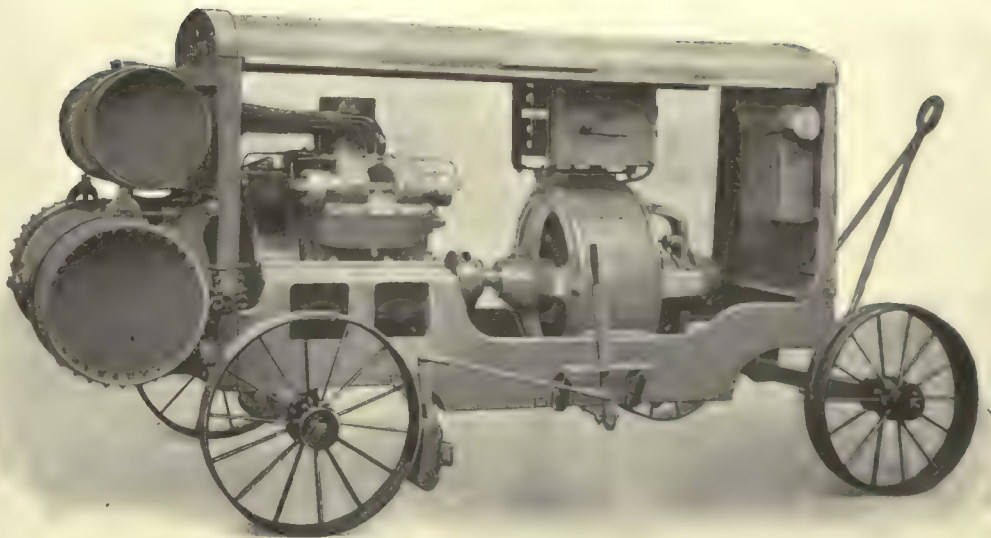
*Mobile, adaptable and
SAFE for regular
maintenance or
emergency service*



J. R. McCardell Co.

Trenton, New Jersey

Sullivan "WK-324," 206-ft. portable compressor on steel wheels an electrically-driven compressor, designed especially for such work as Electric Railway Maintenance

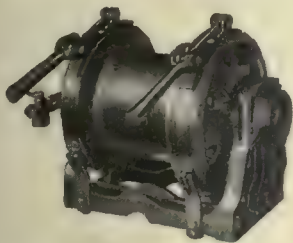


Rotator



Buster

Spader



Turbinair Hoist

Electricity and Air Power

Your electric power, and a Sullivan Electric Portable Air Compressor, offer an ideal means for running air tools in track maintenance work.

Sullivan Portable, Electric-Driven Air Compressors

Sullivan electric "vibrationless" compressors are available in 103 cu.ft. and 206 cu.ft. models. They take power from the nearest feed wire, and are good for 100 lbs. pressure. Mountings are steel wheels, rubber tired trailer trucks, or skids.

The 103 cu.ft. compressor will operate one or two concrete breakers, two tampers, four riveters, four clay diggers, or a rock drill. Sullivan compressors run by Buda gasoline engines are also available.

Catalog 3283-F

Sullivan Rotators, Busters, Spaders, Portable Hoists

SULLIVAN BUSTERS are made in a 48-lb. model for cutting asphalt and light concrete, and in a 75-lb. model that will smash the hardest reinforced concrete. Catalog 3281-I.

Where hard clay is encountered, SULLIVAN CLAY SPADERS will excavate it quickly, and at low cost. Catalog 3281-J.

SULLIVAN ROTATORS are fast rock drillers. Numerous models are available to suit all conditions. Catalog 3281-S.

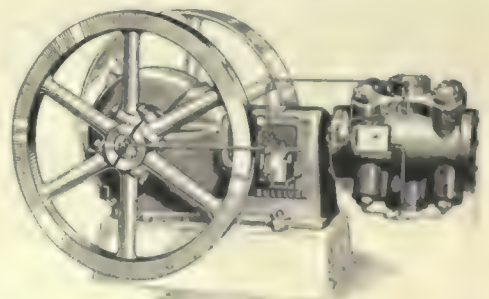
SULLIVAN PORTABLE HOISTS are handy machines for setting poles, unloading rails, or for doing other odd jobs of hoisting and hauling. Both Turbinair and electric single and two drum models are available. They will lift 2,000 lbs., pull a 50-ton car on level track. Catalog 3276-F, 3276-G.

Sullivan Stationary Air Compressors

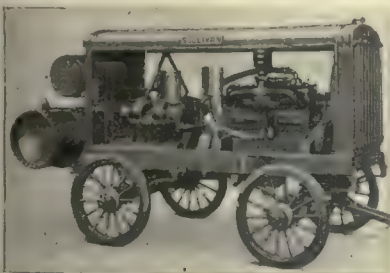
Dependable air power in the shop or in the motor bus garage, for operating air tools, testing brakes, painting and cleaning is supplied economically by Sullivan single stage WG-6 compressors, or the well known Sullivan Angle Compounds.

WG-6 is built in capacities of 68 to 500 cubic feet. Features are Wafer Valves, sweep-control unloading, and total enclosure of all working parts.

Angle Compound features include balanced-angle "vibrationless" design. Wafer Valves, positive force feed lubrication, and multi-step load control. Capacities 400 to 5,100 cu. ft. Catalog 3283-A.



"WG-6" Single-Stage, Belt-Driven Compressor



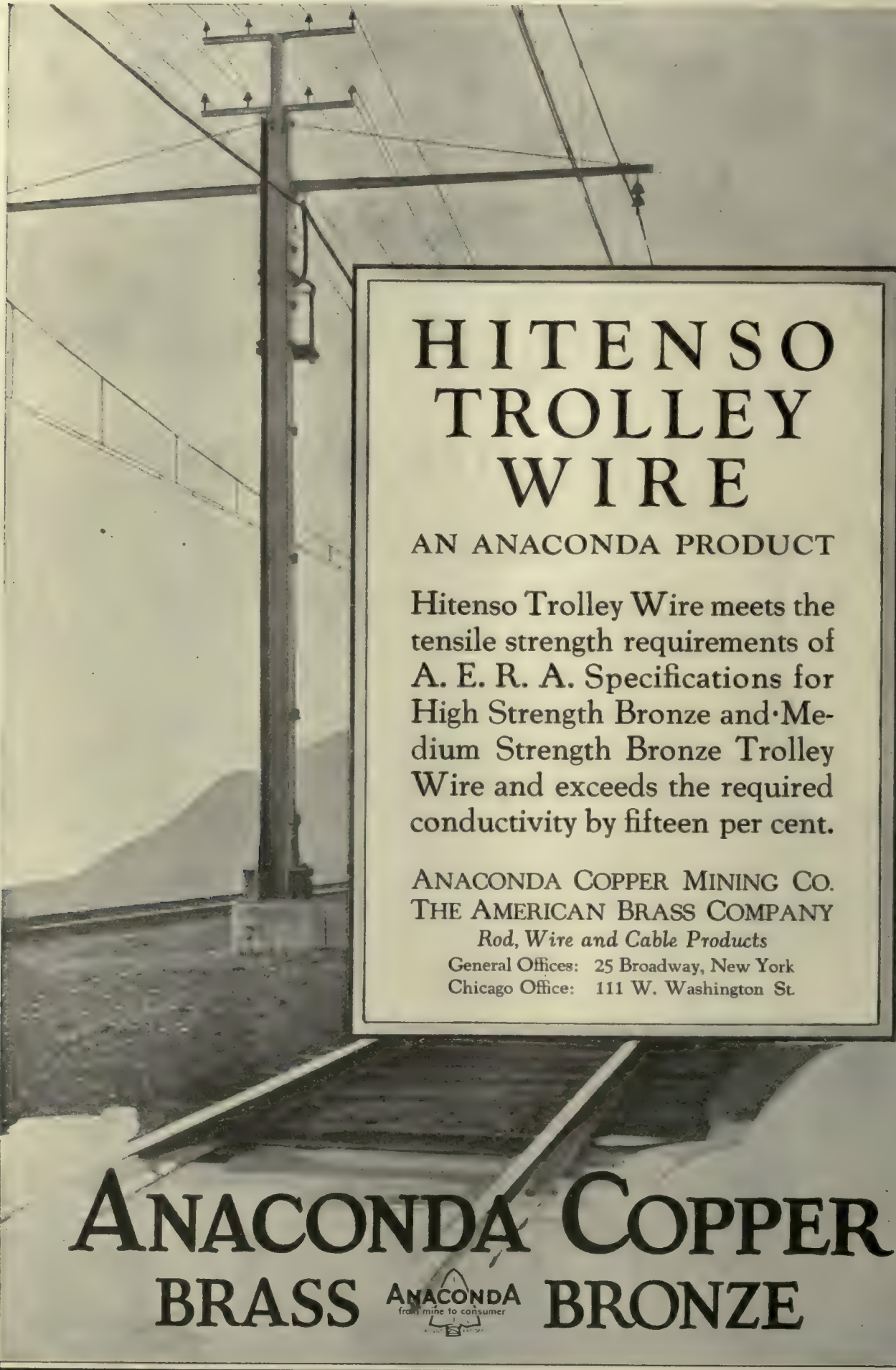
"WK-314," 370-ft. gasoline engine driven portable compressor

S U L L I V A N

SULLIVAN MACHINERY COMPANY
150 SOUTH MICHIGAN AVE., CHICAGO

Boston
New York
Cleveland
Birmingham
Pittsburgh
St. Louis
Knoxville

Dallas
Tulsa
Denver
Spokane
El Paso
San Francisco
Salt Lake City



HITENSO TROLLEY WIRE

AN ANACONDA PRODUCT

Hitenso Trolley Wire meets the tensile strength requirements of A. E. R. A. Specifications for High Strength Bronze and Medium Strength Bronze Trolley Wire and exceeds the required conductivity by fifteen per cent.

ANACONDA COPPER MINING CO.
THE AMERICAN BRASS COMPANY

Rod, Wire and Cable Products

General Offices: 25 Broadway, New York

Chicago Office: 111 W. Washington St.

ANACONDA COPPER
BRASS  **BRONZE**



Differential Dump Car.



Differential Body 3-Way Dump.

at the
Cleveland Convention

THE DIFFERENTIAL EXHIBIT

The Differential Electric Dump Car

Dumps to either side electrically. No labor required for dumping. Places material clear of trench. Load can be distributed as desired. Material can be placed on the job at a gross cost of less than two cents per ton mile.

The Differential Electric Locomotive Crane Car

For handling rails, special track work, ties, bridge timbers, poles, etc. Capacity: 5 tons at radii up to 26 feet, 2½ tons at radii up to 44 feet. Meets all electric railway requirements as to clearances, operating conditions, etc.

The Clark Concrete Breaker

Breaks concrete at less than two cents per track foot, Protects man-holes, underground conduits, etc. Speedy and economical.

The Differential Body—3 Way Dump

Dumps to both sides and to the rear. A simple, sturdy, mechanical hoist. Down-folding side door chutes material away from wheels. Especially valuable in cramped quarters or when track area is torn up. No backing up or jockeying into dumping position. No blocking of traffic.

WATCH them operate and you will imagine them working on your own property—saving labor, reducing costs, and speeding up the job. We can supply you with cost data on the particular operations you will have in mind and the experience of over 60 Railways in the operation of DIFFERENTIAL equipment will suggest money saving possibilities to you.

THE DIFFERENTIAL STEEL CAR CO.

Findlay
Ohio



Clark Concrete Breaker



Differential Electric Locomotive Crane Car.

Locke Insulators Help to Maintain Fast Schedules—

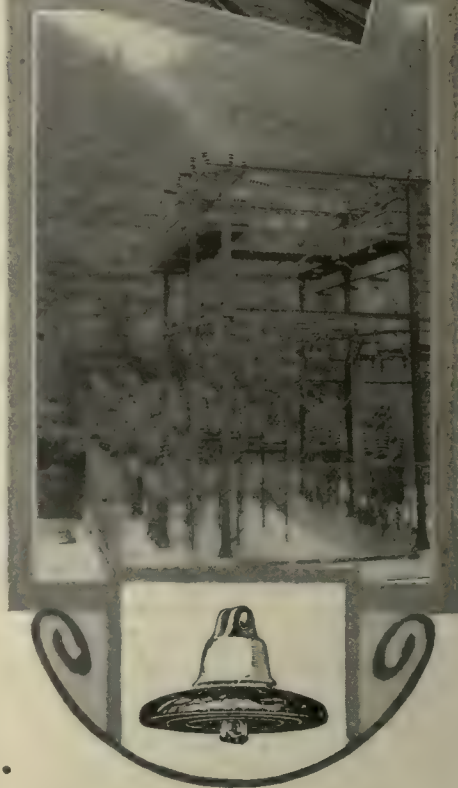


LOCKE Insulators have many important applications in railway work. Their permanent strength, uniformity and resistance to temperature variation make them efficient, silent guides to current flow.

These three illustrations show three phases of Locke Insulator application on one of the country's large systems. The first shows them serving as feeder supports and as tension units supporting the catenary construction on a curve.

The second shows similar service on a straightway. The third represents a typical substation job, where both low and high tension units, of suspension and pin types are used.

Insulators are important. Locke Insulators furnish the service essential to all utility work.



LOCKE INSULATOR CORP.

Baltimore, Maryland



LOCKE PORCELAIN

LOCKE QUALITY

LOCKE SERVICE



How do We Know Dayton Ties Are Good ?

*How Do We
Know Granite
Is Hard ?*

REPUTATION

THE DAYTON
MECHANICAL TIE CO.,
DAYTON, OHIO

There Isn't Any Question About Dayton Tie Reputation

As you are doubtless not a stone cutter, you probably never applied a chisel to a block of granite.

But there isn't any question in your mind that it is hard—its reputation is established.

In exactly the same way we know that Dayton Ties are good.

Everybody who has ever used them says so—insists on it—enthuses over it.

Not surprising either, when you consider that Dayton Tie Track laid 15 years ago—*is as good today* as then.

Dayton Ties give permanently smooth track through indefinite preservation of the concrete ballast.

Nor is this reputation local—125 cities all over the U. S., in Europe and in the Phillipines, contribute to it.

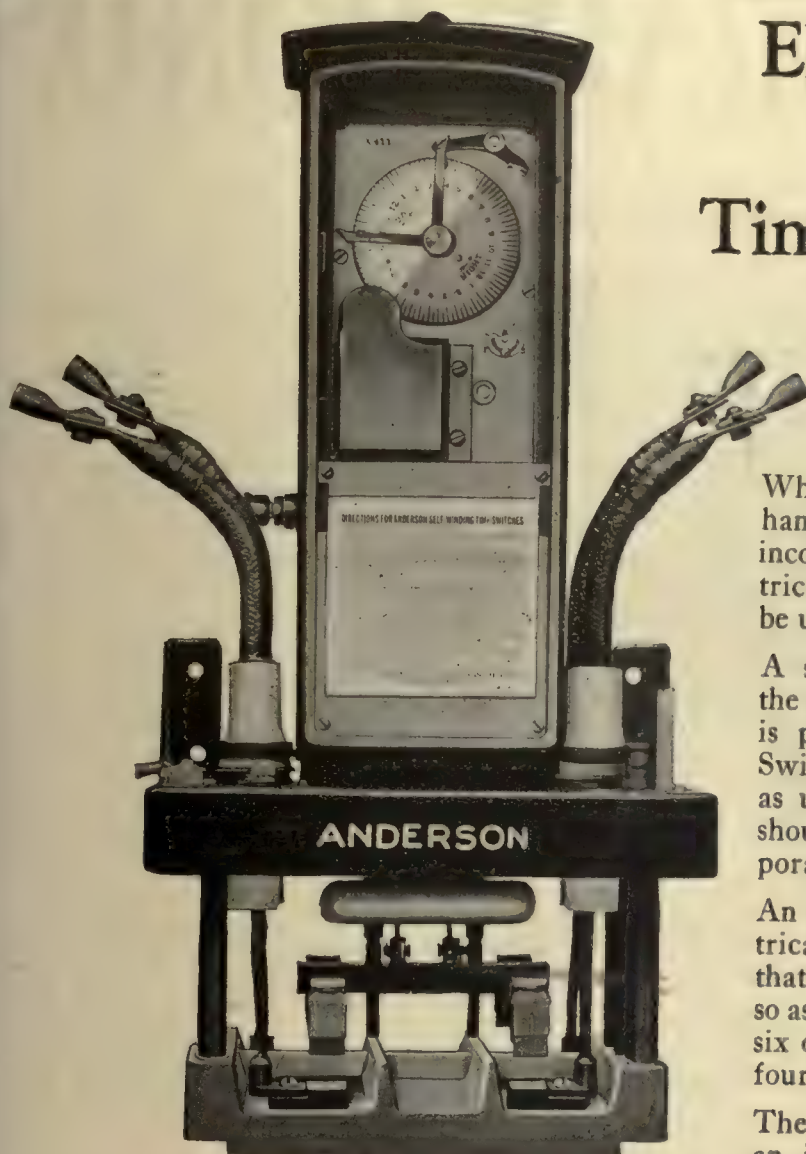
*No. 238-240 AERA Convention
See Dayton Booths*

Dayton Tie Track is always Smooth

THE DAYTON
MECHANICAL TIE CO.
DAYTON, OHIO



Electrically Wound Time Switches



Type SL double pole Oil Break with Oil Tank and door removed.

You will be interested in these Time Switches—that wind themselves, and may be equipped with the practical and efficient Season Changing Device,—for switching on and off your electric signs, illuminated billboards, automatic substations, battery charging stations, motor control, and in fact any place where a time switch can be used.

The 48-page Illustrated Bulletin No. 37 tells more about them and also describes other types of dependable Anderson Time Switches. A copy of this authoritative booklet will be sent on request.

Where weekly windings of the hand wound Time Switch are inconvenient, an Anderson Electrically wound Time Switch can be used to advantage.

A sturdy electric motor gives the driving power, yet a reserve is provided so that the Time Switch will continue to operate as usual for nearly three days should the motor circuit be temporarily cut out.

An added feature of the Electrically Wound Time Switch is that more pointers can be used so as to give as high as six on and six off operations every twenty-four hours if desired.

The Season Changing Device, an ingenious attachment, may also be inserted, whereby the operation of the Time Switch follows the lengthening or shortening of the days—literally following the sun.

The operation of these switches otherwise is identical with the standard Anderson hand wound Time Switches, which have been used so successfully for twenty-five years.

Albert & J. M. Anderson Manufacturing Co.

289-305 A Street, Boston, Mass.

OFFICES: New York, 135 Broadway; Chicago, 105 S. Dearborn St.; Philadelphia, Broad and Chestnut Sts.; London, 12 Moor Lane, E. C. 2.

Manufacturers of Automatic Time Switches, Charging Plugs and Receptacles, Heavy Knife Switches, Circuit Breakers, Insulators, Line Material

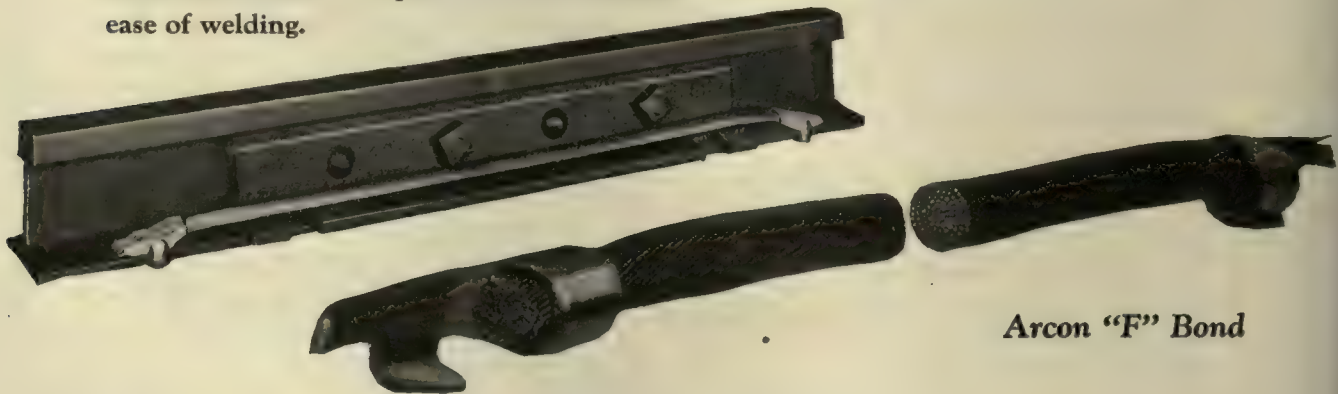
ARCON RAIL BONDS

TRADE MARK REG.



Arcon A
Bond and
Application

To apply the Arcon "F" bond, hammer it onto the rail base and proceed to weld. The pointed hook holds the bond securely in place and will fit between tie and rail. An unusual amount of space is left to insure ease of welding.



Arcon "F" Bond

Arcon bonds make positive the welding of bonds with copper electrodes.

All unnecessary retaining walls have been omitted from these bonds. There are no box shaped metal pockets to interfere with directing the arc.

The open shape of the Arcon "A" terminal is especially desirable since the arc can be directed freely at the junction of the terminal and the rail.

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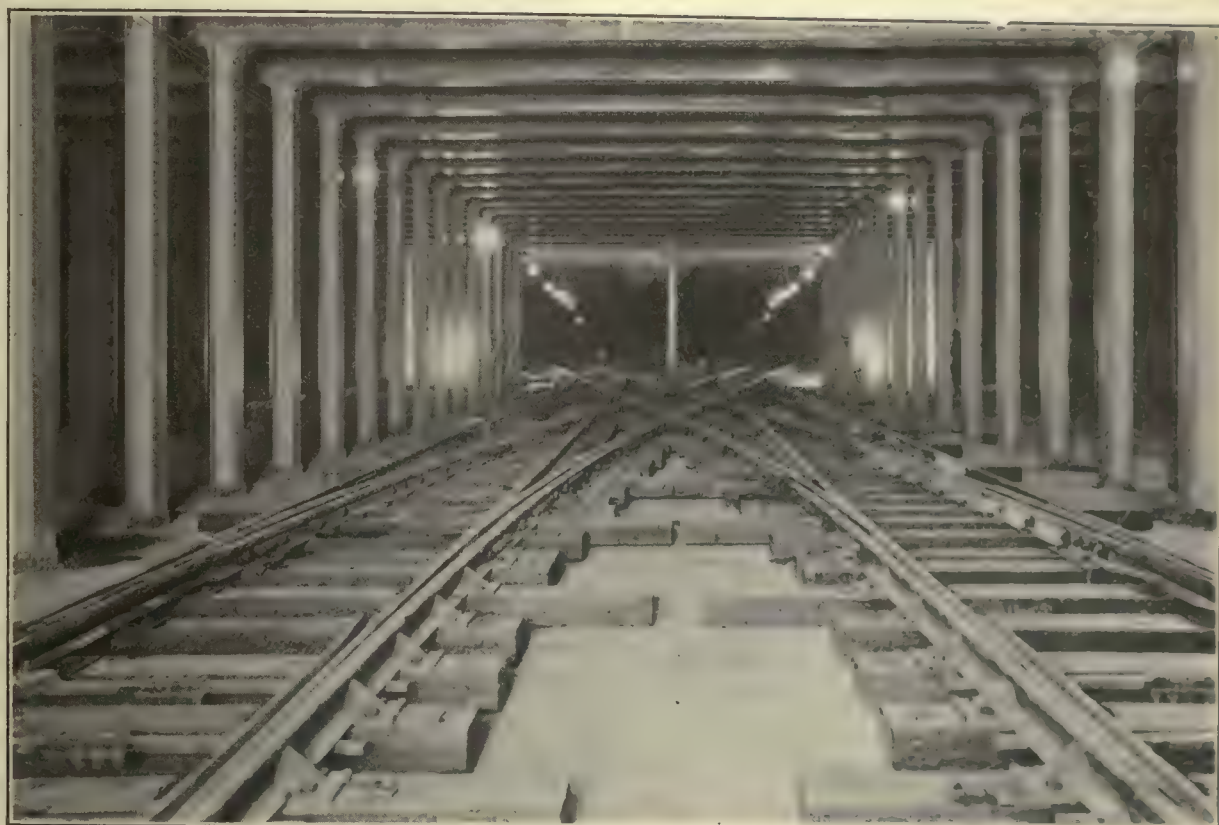
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WHARTON

Tisco

Special Trackwork



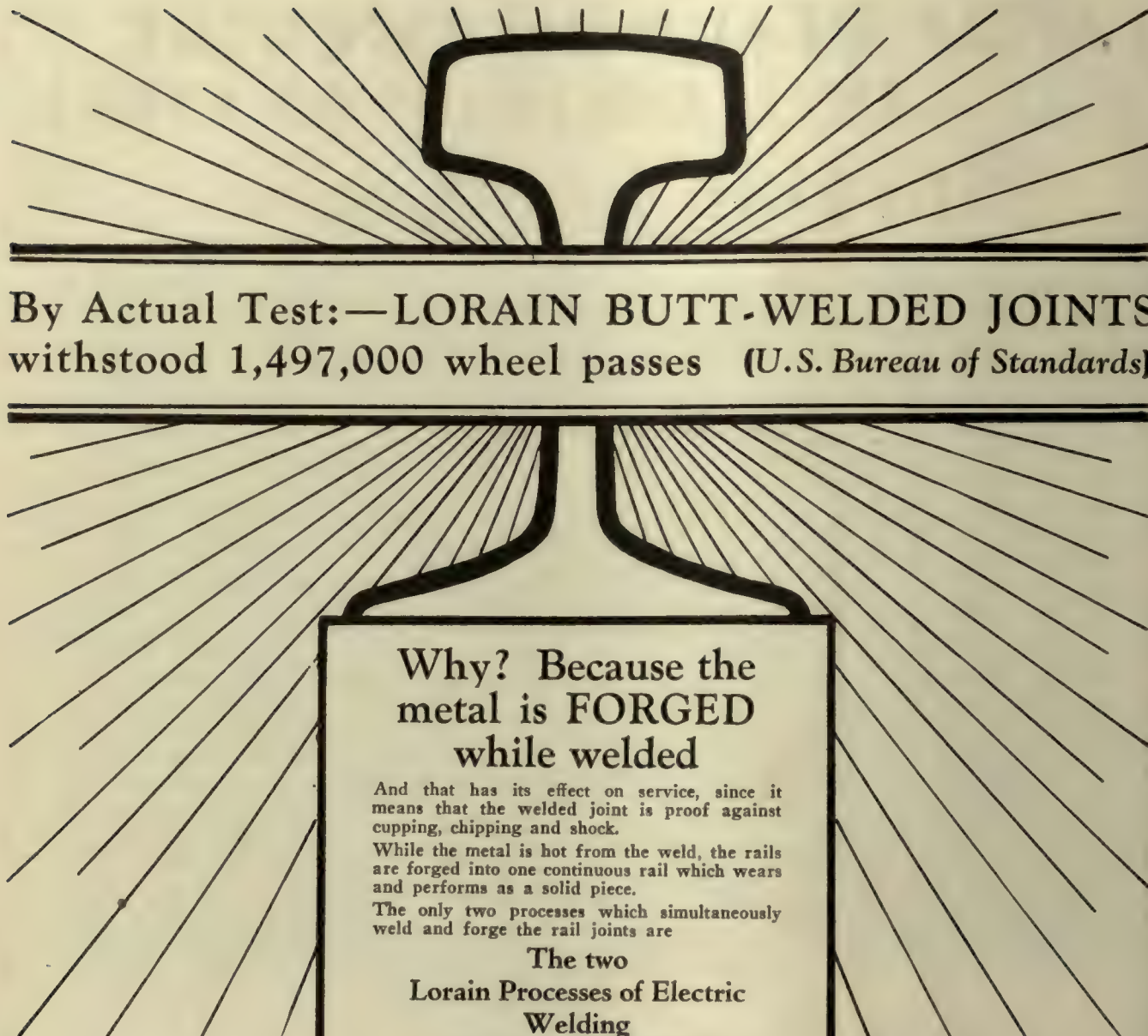
One of the many *Wharton* Layouts furnished the Department of City Transit, Philadelphia, and installed in the new Broad Street Subway

Tisco Manganese Steel was used for the Guarded Double Tongue Switches and in the AREA Rail Bound Frogs.

Numerous *Tisco* Manganese Steel Layouts have also been installed in the subways of New York and Boston.

Visit our Exhibit
Space 209.

WM. WHARTON JR. & CO., INC.
Easton, Pa.



By Actual Test:—LORAIN BUTT-WELDED JOINTS
withstood 1,497,000 wheel passes (U.S. Bureau of Standards)

**Why? Because the
metal is FORGED
while welded**

And that has its effect on service, since it means that the welded joint is proof against cupping, chipping and shock.

While the metal is hot from the weld, the rails are forged into one continuous rail which wears and performs as a solid piece.

The only two processes which simultaneously weld and forge the rail joints are

**The two
Lorain Processes of Electric
Welding
(Butt Weld and Bar Weld)**

United States Bureau of Standards Repeated Impact Tests.

Butt-Welds on Lorain Rail, 624,600 blows, 1,412,500 blows and 1,497,000 blows.

Lorain Solid Rail, 1,353,300 blows.

Bar-welds, 473,500 blows and 694,200 blows.

Compare the above figures with 359,197 blows, the highest number reached by the best of all other types of joints tested and some idea is obtained of the superiority of the Lorain processes.

**The Lorain Steel Company
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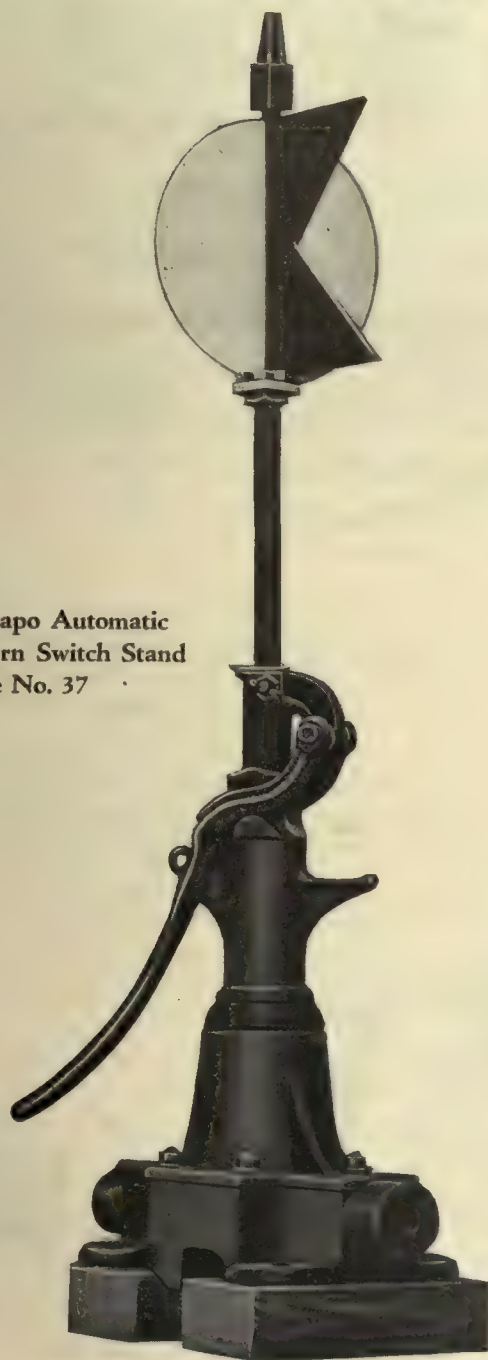
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WHAT DO YOU REQUIRE IN A SWITCH STAND?



Ramapo Automatic
Return Switch Stand
Style No. 37

If it's day-in and day-out performance under the most severe conditions, quick, sure, safe action, durability, low maintenance, or a combination of all, you have it in the Ramapo Automatic Return Switch Stand.

Safety and serviceability, the keynotes of construction, have been maintained over a long period of years. Dependable at danger spots and selected because of their dependability.

Non-failing springs permit the passing of cars, but always return the switch points to original setting. The target is conspicuous. It is rigidly connected to the switch points and positively indicates their position. A partially open switch registers danger.

We would be glad to send you full information concerning these stands as well as on our switches, frogs, crossings and other appliances for tee rail trackwork.

Switches Frogs Crossings
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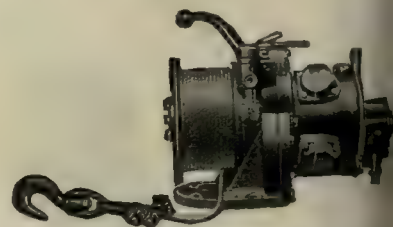
Tamping track with pneumatic tampers insures a smoother and longer-lasting road bed.

See these labor-aiding air tools and machines at our exhibit during the A.E.R.A. Convention, spaces 301, 303, 305, and 307, section E.

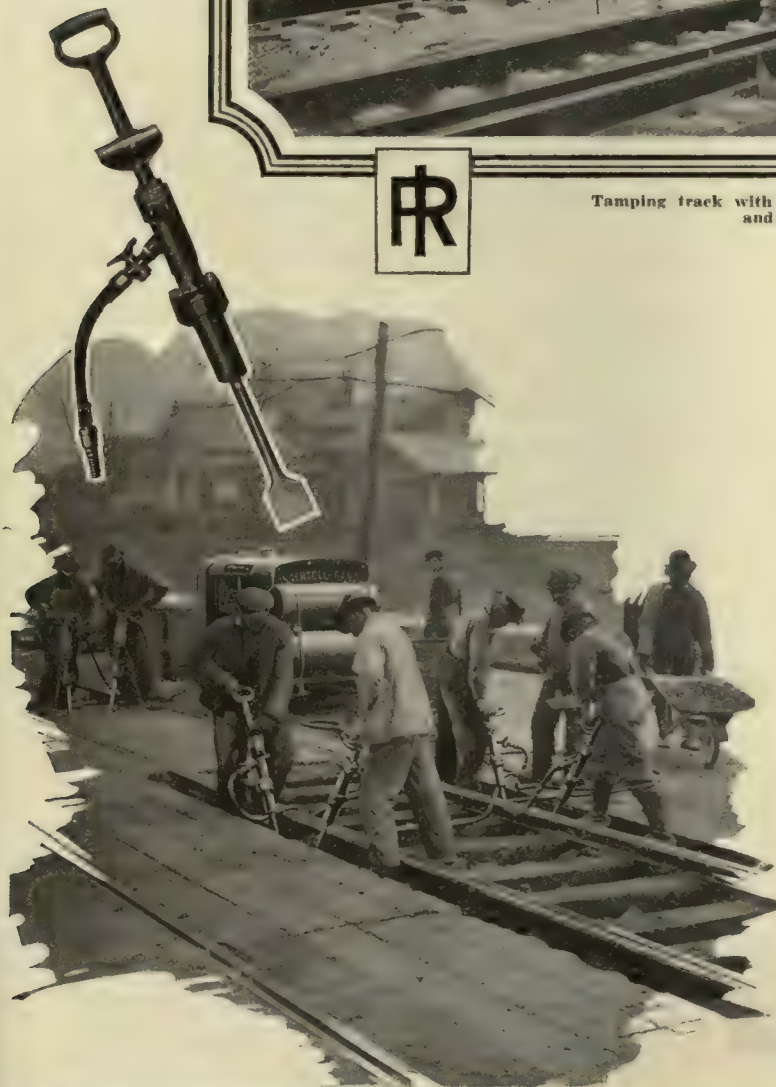
The exhibit will include Tie Tampers, Paving Breakers, Spike Drivers, Rail Drills, Grinders, Pneumatic Diggers, Backfill Tampers, Portable Hoists, Pneumatic Hammers, Portable Air Compressors, and a complete line of pneumatic tools and accessories.



CC Spike Driver.
Drives a spike in 6 seconds.



Utility Hoist. Speeds up hoisting and material handling operations.



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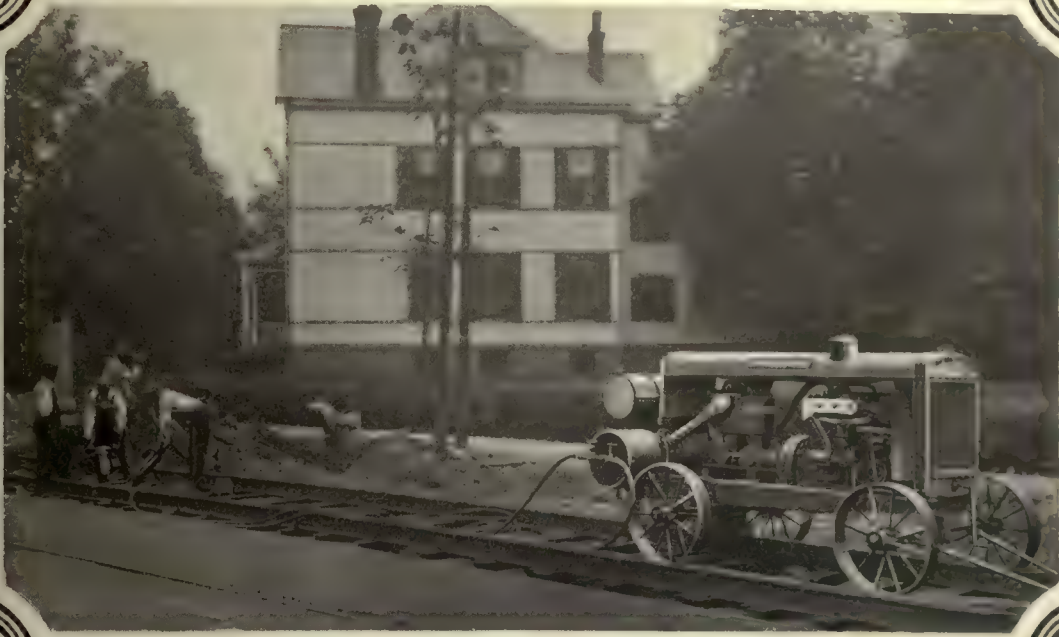
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Breaking out old concrete with CC Paving Breakers operated from Portable Air Compressor.



Reducing Track Work Costs

Costs are greatly lowered on many classes of work when compressed air tools are used to aid hand labor. For instance, pneumatic concrete breakers make it possible for two men to do as much work as a dozen men using ordinary hand methods.

New tools and new ways to help reduce the labor item are constantly being developed. It will pay you to investigate the complete line of Ingersoll-Rand labor-saving air tools for street and track work.



R-1502

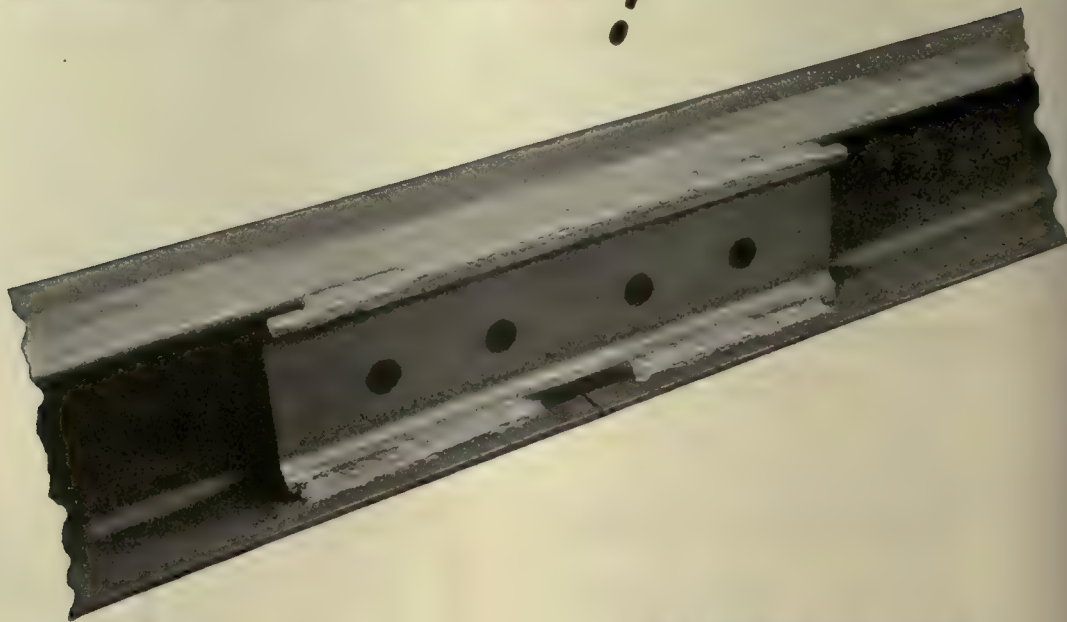


Portable Grinder. Used for grinding rails, switch points, etc. No. 9 Rail Drill. Drills a 7/8-in. hole through a rail in 30 seconds.

134-PC

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Unchanged~ Rail Steel at the Joint!



There is *no gap* between the rail ends in a UNA joint. With the rail ends under mutual compression, the track becomes a continuous band of rail steel.

There is *no heat* applied to the running surface of the rail that might in any way change its physical structure. It is still the same steel that was shipped by the mill.

With no gap—with no change in the running surface of the rail, the car wheels pass silently and smoothly over the joint. There is no more wear at the joint than at any other part of the rail.

UNA joints last as long as the rail. They are easily installed in old or new track.

UNA

PRODUCTS

Rail Joints
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for every type of Welding

Will be shown at

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UNA Welding & Bonding Co.
Cleveland, Ohio



Semi-Fabricated Bates-Truss Structures

Throughout the Skokie Valley route of the Chicago North Shore and Milwaukee Railroad line, Bates-Truss "semi-fabricated" structures are used. This line is the winner of the first Charles A. Coffin award. Similar Bates-Truss structures are used in the "Ideal Section" of the Chicago South Shore and South Bend Railroad.

It would be difficult to secure higher recommendations than these—yet Bates-Truss construction is to be found in modern railway construction in all parts of the world.

The expanded truss is the fundamental idea—a sound engineering product.

Be Sure
to Consider
Bates-Truss

It
Pays!



Bates Expanded Steel Truss Co.

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"One-Piece, Expanded"—expresses the Bates-Truss idea in simple words.

In the Bates-Truss process, a single steel member is slitted, heated and expanded. Expanding transforms the plain web of the beam or channel into a lattice truss of one-piece of steel.

This one-piece truss has the obvious advantages of no joints, no over-lapping surfaces and no eccentric stresses.

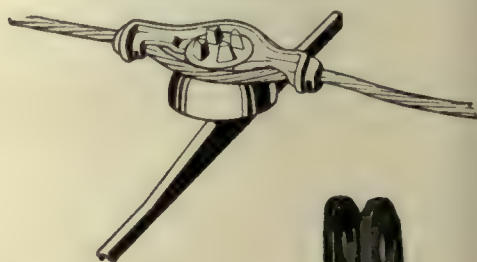
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for Electric Railways—



**See Our Booth No. 253
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**DREW Floating
Bell Hangers**



No more loose ears—lost hangers—the Drew Floating Bell Hanger guarantees a positive, weather-proof lock. Trolley ear can be screwed up tight against hanger on a stud firmly molded into the insulation. Delivery direct from stock.

DREW 7520 Porcelain Clevis Strain Insulators

Serviceable and handy. Afford positive insulation and lock. All parts renewable and shipped at once from stock. Priced at \$36.00 per hundred—you can't afford to be without them. Keep a good stock on hand.



THE DREW ELECTRIC

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DREW Equipment Leads



DREW Splicing Ears

Made in many styles and sizes, cut shows the Type "L" Samson Splicing Ear. They give a permanent, smooth joint. Specify Drew Splicing Ears and be assured of a smooth underrun for wheel, shoe or pantograph.

DREW Cushion Ear



Saves your trolley wire—no bumping or sparking—no "hard spots" on your trolleys. The cushion feature is added by making the groove $\frac{1}{8}$ -in. deeper under the boss for a distance of 6 in. Conforms to A.E.R.A. specifications. Made 15 in. long for 1/0, 2/0, 3/0, and 4/0 round wire. Drew cushion ears are used wherever better service is maintained at lower costs.



DREW Pole Sleeves

Saves old poles, insures new poles against bending and breaking. Made of heavy malleable iron 30 in. long with $\frac{3}{8}$ -in. walls heavily ribbed. The self-locking halves are shipped together and driven to place around the pole butt by a few blows with a sledge. Four lugs at top and bottom provide even fit around pole, and space for cement filler.

Other Drew Products

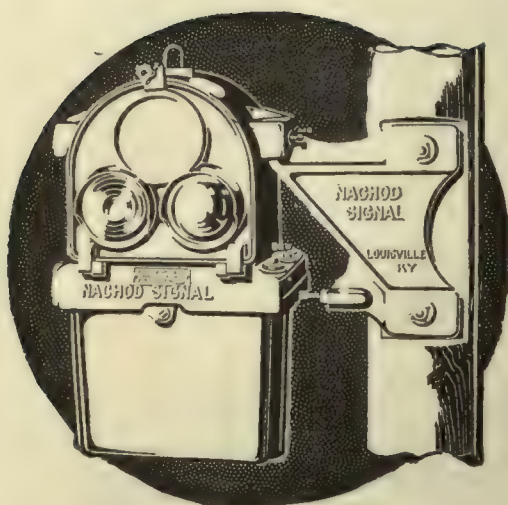
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See them in operation
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BOOTH 235

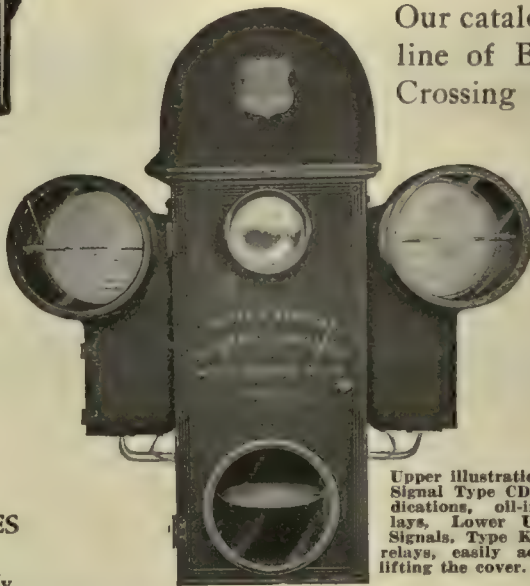
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Clark-Williams Tubular Iron Pole Reinforcing and Extension Clamps

Years can be added to the life of any iron pole which has
become corroded at the ground level with our REIN-
FORCING CLAMPS, or added height may be obtained
by using the EXTENSION CLAMPS.

ALSO MOUNTS FOR WOOD POLES.

Ask for quotations on your requirements.

The Clark-Williams Engr. Co.
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Drip Points for Added Efficiency

They prevent creeping moisture and quickly drain the petti-
coat in wet weather, keeping the inner area dry.

The Above Insulator—No. 72—Voltages—Test—Dry 64,000
Wet 31,400, Line 10,000.

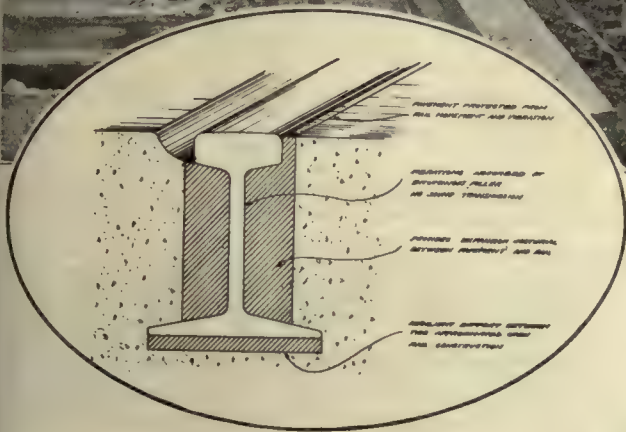
Our engineers are always ready to help you on your glass
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Installing Serviced Rail Filler, Sioux City, Iowa



Sound-Deadening the "Servicised Way" Means Real Pavement Protection—Longer Rail Life—and Economy in Installation and Maintenance

Servicised Advantages

Recent researches on the use of bituminous rail filler have definitely shown its advantage over the other types of filler and standard construction in numerous localities now includes the installation of such a material.

Servicised Rail Filler is effective in the following ways:

1. Sound deadener
2. Waterproofing for rail
3. Protection for pavement due to expansion and contraction
4. Resists weather and traffic action
5. Economical installation

The base is a high grade blown petroleum asphalt selected for its resiliency, weather-resistance, and low temperature susceptibility. This material is uniformly reinforced by long-fibre saturated felt which adds to its strength and reduces brittleness. The mixture of asphalt and felt forms the waterproofing matrix for the partially saturated cellular filler which gives Serviced Rail Filler its remarkable sound-deadening qualities.

By correct proportioning and perfected processing of these carefully selected materials it has been possible to produce a superior type of track insulation.

Servicised Rail Filler meets the most rigid requirements for proper track insulation. Its unusual sound-deadening qualities are due to its carefully proportioned bituminous construction—a construction that also insures water-proofing for the rails, protection to the pavement due to expansion and contraction, resistance to weather and traffic actions, and low installation and maintenance costs.

Write us today for detailed information on this superior type of track insulation.

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RAIL FILLER

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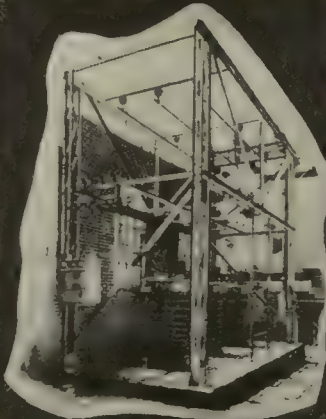
COPPER-ALLOY STEEL POLES



"H" FRAME
CONSTRUCTION



SINGLE
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Truscon maintains a corps of specialists in the design and construction of power transmission lines and sub-stations. They consider every factor bearing upon a given problem. Let them present the facts about Truscon Alloy Steel Poles for your requirements.

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SECONDARY RACK
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Truscon manufactures a complete line of Pole Line Hardware and Specialties made in compliance with the requirements of the N.E.L.A. and A. T. & T. Co. Most of the items are carried in stock for immediate delivery.

Ask for price list

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WAREHOUSES AND OFFICES IN ALL PRINCIPAL CITIES

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SEND TODAY
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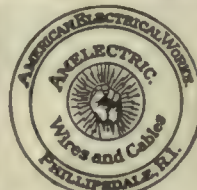
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ELECTRICAL WIRES and CABLES



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The Empire New Process Bolt with threads that match the accuracy of gauge threads, and with its tensile strength up beyond 80,000 lbs. is worth a lot more money to you than any bolt you can buy. Yet the price remains the same

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TYPE A
for use on cast iron.
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for use with automatic
welders.
TYPE F
for general welding of
steel.

The Difference is in the Treatment

Ordinary welding wire has minute pores filled with moisture and hydrogen which cause tiny explosions—sputtering—dissipation of the metal.

The base wire of Type "F", G-E Welding Electrode alone is a good bare electrode. By a special General Electric process, moisture and hydrogen are reduced to an absolute minimum. Stabilizing substances become a part of the electrode.

The arc is much more stable. It is more concentrated.

Naturally, an operator working with Type "F", G-E Welding Electrode can produce better work and more of it. Doesn't this suggest real economy? Any of the special G-E Welding Electrode Distributors will be glad to give you more information and samples.



In absolute reliability of operation and over-all efficiency, G-E Arc Welders are unequalled. They are available in all sizes, all types—for either hand or automatic operation—for one or more operators.

SERVICE

Special Distributors for G-E Welding Electrodes, located throughout the country, are equipped to give you prompt service. Get in touch with the G-E Welding Electrode Distributor near you or write to Merchandise Department, General Electric Company, Bridgeport, Conn.

550-19

GENERAL ELECTRIC

MERCHANDISE DEPARTMENT, BRIDGEPORT, CONNECTICUT



Substations and Civic Pride

There was a time when the building of a substation in a residential or even a business district started several "committees" on the warpath.

Today, many a progressive community is proud of a beautiful little building which houses a G-E automatic substation without a murmur to betray the fact that it contains machinery. Citizens scarcely realize the part that this little building plays in the every-day rail transportation which they have come to take for granted.

And best of all, from the operator's point of view, these up-to-date installations do their work day in and day out with no station attendant.

GENERAL ELECTRIC

330-69





Building on the



Georgia Railway and Power Company Atlanta, Georgia

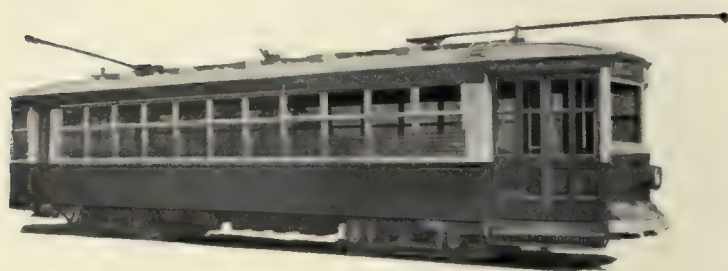
An extensive modernization program in the city of Atlanta involving new one-man cars has shown a return on the investment of approximately 25 per cent. The operating company credits the revenue to the higher schedule speed made possible by this equipment, and to the larger capacity, lighter weight, and attractive appearance of the new cars.

Operating expenses per car mile for 1926, less depreciation, were \$.2897.

Eastern Massachusetts Street Railway Boston, Mass.

Modern cars and equipment have increased revenue and reduced operating costs. The first nineteen de luxe cars brought an increase in revenue of 8 per cent, thereby convincing the management of their desirability. Now 100 de luxe cars are in service on this road.

Since 1920, maintenance of equipment has been cut in half, pull-ins have been reduced nearly 600 per cent, and the intervals between overhauls increased over 300 per cent.



Starke Electric Railroad Company Alliance, Ohio

Modern, light-weight, one-man interurban cars made possible a 20 per cent reduction in operating expenses for the first six months of 1927 as compared with the same period in 1926.

This reduction in operating expenses, together with a 180 per cent increase in operating income, resulted in a gratifying net income for this company.





Foundation

Operating companies and communities at large have come to recognize the economic position of the electric railway as the foundation of popular transportation service.

Needless to say, operating companies cannot maintain this position without modern, up-to-date equipment—equipment that pays.

In the building of a permanently efficient and profitable system, there must be a proper correlation of service—a choice of methods best suited to the various needs. But experience indicates that electric cars will continue to be the foundation—electric cars built to please a discriminating public and equipped with up-to-date G-E motors, control, and auxiliaries.

The Toledo and Indiana Railway

The Toledo and Indiana Railway replaced nine old cars with seven modern, light-weight, one-man cars. In the 1,050,000 miles which they covered in two years, these new cars so reduced maintenance costs, power costs, and platform expense that the investment of \$105,000 is saving annually:

Maintenance	\$10,060
Power	23,824
Operators' wages	8,784
Total saving	\$42,668





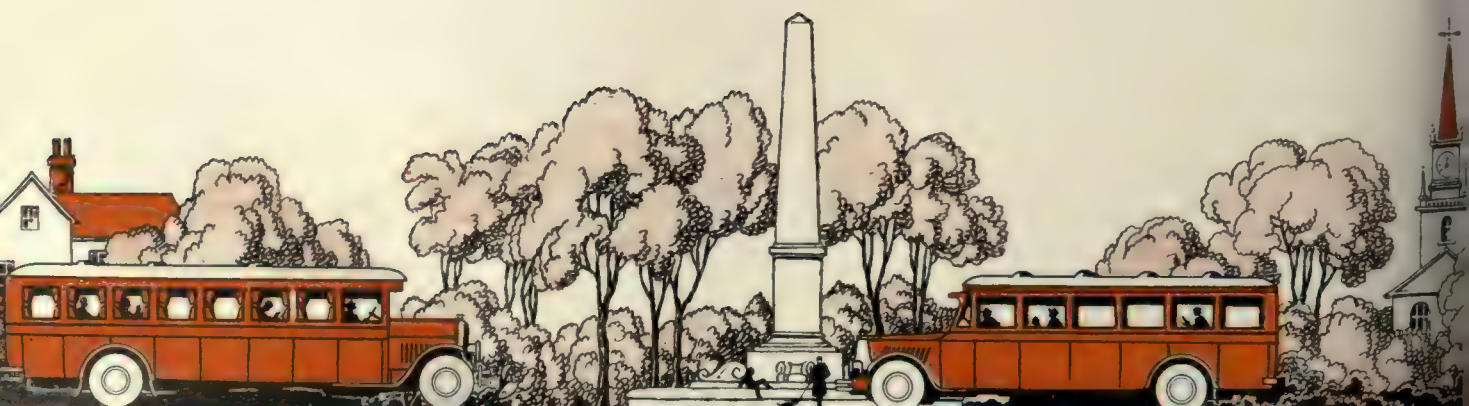
The Day of the



AFTER four years of experiment, the industry has a clear idea of the field of usefulness of the bus.

In the gas-electric bus it has a vehicle exactly suited to the needs of the service—quiet, smooth-running, easily operated, economical in maintenance, long lived, and profitable in operation.

That is why 18 operating companies have applied 1439 G-E equipped gas-electrics to a varied service—





Gas Electric Bus



routes in crowded down-town streets and in quiet residential districts, local service where exacting schedules must be met, interurban duties where unusual grades offer difficult problems.

G-E gas-electric equipment is now made in three sizes, covering the requirements of all types of buses; and available operating data show very clearly that its use has attracted new patronage and created invaluable good will.



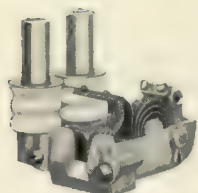


Up-to-date equipment plays its part

The WP-30 motor was one of the first built for railway service—yet it served faithfully for more than twenty-five years. Its excellent record is due not only to the superiority of its design and construction, but also to the fact that exact renewal parts were always available for its maintenance.

It is a long step from the WP-30 to the modern G-E railway motor, but G-E renewal parts service has kept pace with improvements in design. Constant engineering attention to original equipment quality, and the availability of replacement parts in all sections of the country have contributed largely to economy in the maintenance of electric rolling stock.

Use your G-E Railway Supplies Catalog to simplify your buying.

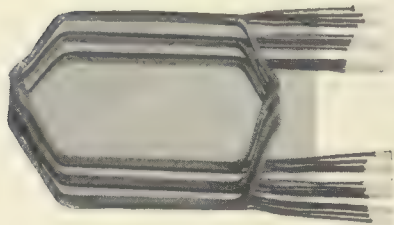


Renewable Carbonway
Brush-holder

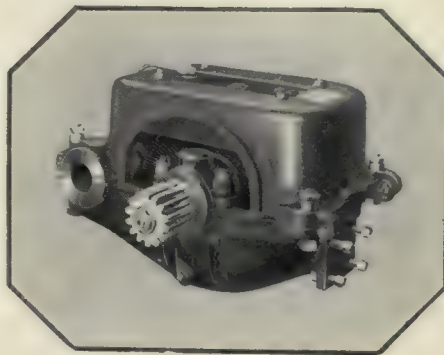
GENERAL ELECTRIC



Brass Babbitt Lined
Armature Lining



Armature Coil for Railway
Motor



WP-30 Railway Motor



Hinged-type Controller
Finger



Electric Railway Journal

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Meeting the Demand for **BETTER TRANSPORTATION**



NLY a few years ago the electric railway industry was laboriously struggling up the road of recovery, carrying a staggering load of public burdens cumulatively imposed. For more than a decade it had been encountering fresh obstacles at each step. A method of surmounting each new difficulty was no sooner devised than trouble from another quarter loomed on the horizon. A tired and discouraged industry sought to maintain faith in the future and strained vainly to catch a glimpse of the bend in the road ahead.

Today those who are in position to view in perspective the ground gained are united in the conviction that the turning point has not only been reached but has been definitely passed. There is a widespread feeling that the succession of difficulties is nearing its end and that the energy and ingenuity which have for years been spent in staving off disaster may now be directed toward accelerating progress. Each step forward may be expected to count as a definite net gain instead of being merely an offset to a backward drift.

Of course the road is still far from smooth. That makes it difficult for those in direct contact with day-to-day problems to see clearly that substantial gains have been made in a comparatively short period of time. But there is much work left to be done. A better understanding of the part which organized public transportation can be made to play in bringing about more efficient use of existing street facilities is necessary before the industry may be expected really to hit the full stride of development and expansion to which it is destined. In preparation for this larger destiny it is important that transportation executives win for themselves a position of recognized leadership in community affairs. This they can do only by gaining public confidence through demonstrated sincerity of interest in the community's problems and by being fully qualified to speak with authority on matters affecting street traffic.

In addition to all this, one outstanding and pressing problem demands immediate and concentrated attention. It is the last great obstacle that blocks the industry's path. Everything depends on our ability to surmount it. In short, a way must be found to win a growing volume of business from an automobile educated public. The character of service must be brought up to the level of present-day transportation standards.

IT IS no easy matter to determine the relative importance of the various factors which attract riders to our cars. We know that cars must be quieter, faster, more comfortable and more attractive in appearance; that service must be more frequent; that there must be less crowding in rush hours; that employees must be more courteous and better trained as salesmen. We know and are discussing many other factors which influence our success in winning riders. But we are still a long way from determining just how, and just how far, improvement in each of these elements of our service can be brought about. What are the elements that make for attractive car appearance? To put this another way, what is a good-looking street car, and how much does its appearance affect the number of people who ride? What are the most comfortable seats, and how far can an operating company afford to go in adding to first cost and maintenance expense in finishing and equipping cars?

The industry must find the way to increase its riders at a profit. In every step of this process, however, there is the problem of balancing improvements against the revenue required to make them self-supporting. It is necessary to find the field for each form of public transportation service and for each type of vehicle, whether on steel or rubber tires. Hope of breaking down the last great obstacle in the way of complete recovery for the industry depends on our ability to meet today's demand for better transportation.

The Right Type of Car Helps to Build Riding

STYLES exist in transportation just as they do in clothes, furniture or jewelry. What is popular today may be out of date tomorrow. Often the style is adopted because some one else has decided it for a reason entirely foreign to the ones that should govern logically. In the past there has obviously been too much tendency for the rank and file of the transportation industry to follow the styles set by the leaders, who usually are located in the cities with heaviest traffic.

Cars designed for service in the largest cities frequently have been adopted in small towns. Worse still, units that have outlived their usefulness for the big companies have frequently been sold to smaller companies and used without change in a class of traffic for which they are entirely unsuited. There is a strong temptation to use cars too large for a given service, first to get increased capacity per platform employee, and second to imitate a larger neighbor.

Two fundamentals underlie all community transportation. These are speed and headway. The patron wants to go from one point to another in a minimum time. Whether he spends time in riding or in waiting for his conveyance, he is equally annoyed at delay. Headway, however, seems even more important than speed, particularly where the rides are short; as the time saved by fast running may easily be lost if the spacing between vehicles is so great that long waits for the cars are necessary. For instance, if the headway is fifteen minutes, few persons will ride the cars for the distance of a mile or less, because the time of the walk will be little if any greater than the time of the ride plus the average wait. Those who do desire to ride are more than likely to use their own automobiles.

Where the traffic is light it follows naturally that the smallest unit consistent with economy of operation is the one to use. Here conditions dictate the single-truck, one-man car. For territory that is more densely settled shorter headways with small cars are preferable up to the point where the urge to walk as a means of saving time has been fully met with frequency of service coupled with reasonable schedule speed. Beyond this it is desirable to increase the size of the unit rather than to give greater frequency of service, using light-weight, double-truck cars. This reduces congestion, increases the comfort of the passengers and lowers operating costs.

For the heaviest traffic the smaller double-truck cars do not have sufficient capacity, and under certain conditions even the largest double-truck cars are insufficient in size. When such extreme traffic density is reached, it is desirable to run the large cars in trains of two or more, or to group bodies together into articulated units. The situations which cannot be met with these types of equipment are rare, although the growth of American cities is making the problem acute in several of the larger communities. For these, of course, the logical thing is to provide rapid transit lines on exclusive right-of-way, leaving to surface transportation the local business.

With the field thus divided, there is a rather distinct need for all the types of cars—single-truck, small double-truck and large double-truck. All of them should be relatively light in weight, although the large cars should be adaptable to train service. In any particular community, except the smallest, all three types may be needed to

cover to the greatest satisfaction the demands of the riders and to get the greatest revenue. While a compromise is sometimes made for economy, it may be questionable whether the savings effected by standardization will offset the loss of traffic where large cars on long headways are employed to serve some of the less densely settled districts. Each case should be studied carefully if the correct type of car is to be selected.

Economics of Bus Operation Better Understood

GRADUALLY the place of the bus in the general transportation scheme is becoming more clearly defined. It is still too early for a final definition of its field of usefulness, but great strides have been taken away from the chaotic thinking which prevailed on this subject a few years ago. One reason for the confusion that existed is that we have been inclined to consider buses as a homogeneous species, whereas in reality there are many different kinds of buses in many different classes of service. Large buses and small, single-deck and double-deck, street car type and de luxe; each has its place, but they cannot be used interchangeably.

It is now evident that one of the major fields of usefulness of the bus is in rendering a class of service different from that of the electric railway. By furnishing service superior in comfort, convenience and speed to that of the street car the bus meets a real transportation need. Despite the higher fare which must necessarily be charged for such service, experience in various cities where de luxe service has been tried shows that there exists for it a substantial demand. Indeed, the actual extent of this demand has never been measured, because it continues to grow rapidly as facilities are increased. Apparently the saturation point is a long way off.

Street car type buses also have a real place in the general transportation scheme. It is not as a substitute for the rail car in any large way, however, that this type bus is most useful, but rather as an auxiliary to supplement and extend the service. On lines of heavy traffic the bus can be used to advantage in express service, while the cars do the local business. Whether such express service should be operated at street car rates of fare or whether de luxe or semi-de luxe service should be given at a higher fare depends on local conditions. Both kinds of operation have met with marked success. Use of the bus to do local business while the cars operate express has been tried to a limited extent. In general it has been found easier to maintain high schedule speeds with small capacity vehicles on rubber tires than with rail-bound vehicles of larger capacity. Greater economies can be accomplished, however, by saving hours on a heavily traveled line, and it is likely that express car and local bus operation will be developed more extensively in the future. Use of buses as extensions to the rail system is so well known as to need no comment.

Double-deck buses have done well under conditions favorable to their operation. Experience shows, however, that something more is needed for their success than mere density of traffic along a particular route. Their field of usefulness appears to be in giving a service that combines elements of sightseeing with straight transportation. Unless the sightseeing element is present, passengers will not use both of the decks to an extent sufficient to make this class of vehicle economical in comparison with the single-deck bus.

Great as has been the progress made in fitting the bus into the transportation scheme, its proper place is not yet understood by all. Electric railway men were slow to take up the bus. During the past two or three years the tide has turned and many thousands of buses have been put in service by the railways. Now there is a tendency in some quarters to condemn bus operation as an unprofitable venture. So it has been where the right type bus has not been used in the right place. Therein lies the secret of success. The transportation demands of each community, and each section of the community, must be met with vehicles of appropriate type.

Out of the School of Experience

NO NEED exists to attempt improvement or embellishment of the statements made elsewhere in this issue regarding the outlook for the industry by operators in the North, East, South and West. Idealism has come into the railway business. A seat for every passenger is still a long way off, but the industry apparently is headed in that direction. It is no accidental concept. Neither are the other concepts of speed, comfort and convenience in transportation, so strongly emphasized, nebulous things of the future. Of course, reservations must be made. No business can give a service out of proportion to the rates charged.

While low-fare transportation may be looked on as a basic commodity, the comments of these experienced operators show that the brand of transportation furnished a generation ago is by no means acceptable to the public of today. It is only by having sufficient discernment to sense the demand and to satisfy it that the transportation system of tomorrow is to be successful. Qualities that are being demanded are speed, comfort—almost luxury—and frequency. It is not for the men of the industry to cry that the use of private automobiles has perverted the public taste. Should conditions change and a demand for plain food be made, then is the time to curtail and to furnish a product at a minimum price.

Each man speaks from the fullness of his own experience and of his own observation. Other businesses have had to be revamped. It is no discredit to the electric railways that they have been forced to do so. More is it to the credit of the industry that so many have recognized the need, and set about the process so convincingly. He always finds it difficult to survive who opposes himself to custom. And transportation customs are changing rapidly. Utopia is not likely to burst upon us, but the railway man who correctly senses his obligations and intelligently sets about the task of meeting them is no longer a pariah among the dispensers of the world's goods.

Sound Basis Important in Rapid Transit Planning

RAPID transit is a major problem confronting all large cities to-day. No other single factor has greater influence on their development. Provision of adequate transportation facilities is essential to the welfare of the community. In the past there has been too much haphazard construction. There has been too little realization that transportation is a civic matter.

Experience has demonstrated conclusively that a rapid transit system cannot be built and operated on a self-supporting basis under present-day conditions without

an excessive fare. Since the car rider cannot be expected to carry the whole burden, part of it must be carried by the other beneficiaries. The city as a whole benefits to some extent through the increase in roadway space brought about by the removal of traffic from the street to the rapid transit right-of-way. The adjacent property owners benefit largely on account of the increased accessibility of their land. These beneficiaries must pay part of the cost if the expansion of facilities is to keep pace with the community's growth.

Congested conditions now existing in large cities are the direct result of concentrated commercial development. It has been customary to condemn this tendency to concentration, but a different view of the situation is expressed in an article on rapid transit appearing elsewhere in this issue. Concentration undoubtedly promotes efficiency in the conduct of business, by reducing the time required to go from place to place. Centralization of many business activities within a comparatively small area is feasible only where rapid transit lines exist to carry the large number of people who live in remote localities into and out of this district every day. Thus it may be said that adequate facilities of this kind are essential to the most efficient conduct of business, as they are to healthy civic development.

It must be remembered, however, that there are physical and economic limits beyond which it is practically impossible to carry the provision of rapid transit facilities. When the cost of transportation becomes greater than the value of the time saved, however, concentration ceases to be desirable. Careful planning and close co-operation between municipal and transportation officials is essential to the creation of a successful rapid transit system.

Franchises and Regulation Needed for Taxicabs

HAS the taxicab a place in a system of co-ordinated community transportation? In two major cities of the country this question has apparently been answered in the affirmative by existing local transportation companies. Undoubtedly the taxicab affords the nearest approach to the service of the privately owned automobile. Operation by a responsible company in co-ordination with other existing forms of transit would seem a step in the direction of stabilizing the character of such individual service and of making it an active agency for reducing the use of private automobiles on congested city streets.

From the standpoint of operation at a profit, however, the taxicab presents a number of problems. The financial history of its operations is by no means an enviable one. Although the general effect of competition has exerted some pressure toward a lower scale of taxicab rates, when the rates have gone down the character and the reliability of service have degenerated to a point that seriously reduces its desirability. The situation of this business is an example of the degenerating effect upon any utility service of destructive competition brought about by the lack of monopoly and adequate regulation. The need for regulation and organization with the concomitant elimination of destructive competition must be more generally heeded by public officials before transportation companies may be expected generally to add taxicabs as the next logical step in rounding out their service.

Building Increased Riding Is the Industry's Greatest Immediate Problem

Economical operation is important, but the industry's future hinges on increasing revenue. Public transportation must win out on its merits if it is to survive the inroads of the automobile

By B. C. COBB

*Chairman Advisory Council
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IF THE local transportation industry is to survive and develop on a profitable basis, it must find a way to increase riding and build up its revenues. Every measure adopted to meet the demand for better transportation must have as its definite object the increase of patronage on the public transportation system. Electric railways have met during the past ten years—and in general have survived—a series of unprecedented burdens and difficulties. They have hung on with great courage, and with almost superhuman ingenuity have counteracted one difficulty after another with compensating operating economies.

To the fact that public transportation constitutes a basic necessity in the life of every community of any considerable size, and to the operating economies which have been devised to meet rising costs and unfair burdens, may be attributed the survival of this business today. Economy continues to be important. The street railways of the country are far from a position where

they can afford to relax for a moment the strictest vigilance over every penny of operating cost. But they cannot continue to exist, much less develop, on a declining or even stationary volume of patronage. The problem of the moment is to increase riding. It is futile to dodge the fact that this is most serious and baffling.

Street railway riding has increased during recent years on some of the larger properties, but this has occurred principally in the very large cities where the use of private automobiles is materially curtailed by congestion. In cities where there is opportunity for the optional use of automobiles, street railway riding is barely holding its own, and in many of the smaller cities is failing to do so.

At first glance this may present a gloomy picture of the situation, and in a measure that is true. However, when we stop to consider the immensity of the difficulties through which local transportation has come, it is at least conservative optimism to believe that the recurring series of obstacles encountered have run their course and that a better public understanding and increased public co-operation will make it possible for transportation systems to surmount the greatest hurdle of all—that of increasing riding in the face of unprecedented growth in the use of private automobiles. That this solution lies in the direction of meeting more nearly than has been done in the past the present-day standards of transportation demand is apparent to any one having a knowledge of the rudimentary principles of merchandising.

I have faith in the local transportation industry and in its ability to meet present conditions. That does not mean that all present properties will survive. Some of them should never have been built. But I am convinced that the modern city must have efficient public transportation and that the only course available for attracting sufficient revenue to these properties, to put them on a profitable basis, is that of determining a proper balance between the character of the service offered and the rate of fare charged.

In the past electric railways have been too timid in approaching the matter of an adequate fare. The American people have become accustomed to paying two or three times what they formerly did for practically every necessity of life, and increases in even far greater proportion in the case of luxuries. There is no reason under the sun why transportation should be an exception. There is considerable evidence that the public is acquiring a better conception of the relation between service and rate of fare. In most cities throughout the country there has been some measure of relief granted, and it is reasonable to assume that an adequate fare basis can ultimately be obtained.

There are many examples of the tendency on the part of the public to assume a more reasonable attitude regarding franchise conditions, taxes and unfair imposts. This public awakening is one of the most encouraging tendencies in the present railway situation. If service can be so developed as to win an adequate increase in riding at rates of fare that will show a reasonable profit, then local transportation will again have definitely

entered a period of successful operation and development.

Right here let me add a thought on the automobile. There is no question but that the individually owned car is the greatest competitor of our public transportation systems. But even though the automobile is responsible for the checking of electric railway riding, and some classes of steam railroad riding as well, it has at the same time greatly added to the sum total of the opportunities for wholesome relaxation and pleasure for workers in moderate circumstances. The automobile industry has become of major proportions in our industrial life. It provides employment for thousands of workers and is an important element in the prosperity of many lines of industry.

The right to use the individually owned car is one that cannot be questioned. Needless restrictive legislation is a bad thing for industry generally and for the nation. Of course, the right to the use of automobiles should not include the right to store them in congested public streets or highways. The user of an individual

machine must not be permitted to interfere or retard the use of streets by those millions who travel on street cars and who may or may not be able to afford a private car. At the risk of repetition I want to stress the point that public transportation service must win out on its merits if it is to remain a sound investment for private capital.

To my mind that is the alpha and the omega of meeting the demand for better transportation. Low fares will not attract sufficient riders to compensate for the loss in revenue that results. The character of the service rendered in each community must be adjusted with the primary object of attracting riders on an adequate rate of fare. In many cases this demands more attractive equipment. Street cars must appeal to the eye of the prospective rider as well as to his purse. Likewise they must be quieter in operation, faster and more flexible. All these things are elements in meeting the desires of the automobile educated rider. Upon the question of whether or not they can be made to pay hinges the future of the industry.

Progress of the Year in Meeting the Demand for **Better Transportation**

A changed public requires something more of public transportation than in the past. Both operators and manufacturers have a responsibility in meeting present-day conditions

By W. H. SAWYER

President American Electric Railway Association

TRANSPORTATION is a vital community requirement. The roots of our industry are buried deep in the foundations of community prosperity and growth. But during several years conditions have been changing rapidly. Yes, changing, not yearly or monthly, but daily. During the past year there have been many changes. There has been outstanding progress on many properties. In few instances, however, have the possibilities for the further development and improvement of the local transportation industry been exhausted.

That doesn't mean that all existing transportation properties can be made profitable. Some properties are headed for the scrap pile. They don't have and probably never did have the potential revenue-producing territory that is the essential reservoir to which any improvement or development program must look as its source of profit. This same qualification applies to some of the lines on properties that as a whole are sound, but that need to have unprofitable appendages lopped off before the enterprise can be put on a sound operating basis.

Returning now to the question of meeting the demand for modern transportation. That is the big job before the industry, and one on which considerable progress was



made during the past year by many properties. It consists of developing public transportation vehicles and service to meet the present-day public's ideas and demands. This is a different public than we have been accustomed to serve, and for which most of the cars we operate were designed. It is an automobile educated pub-

lic. A "silk stocking" public, it has been called. Meeting the demand for modern transportation to me means raising the standards of each class of public transportation to meet the tastes and desires of today's public. Improved cars alone will not do that, but they are an essential part of an improvement program. There must be smooth track as well; quieter operation, higher speed, increased frequency, greater reliability, more courteous service—more personal service would be a good way to express it. The automobile rider has tasted the luxury of individual transportation. He is no longer content with former standards of the public carrier, even at a very large saving in cost. In fact, experience is beginning to show that cost is secondary and that electric railways have overestimated the effect of fare on the volume of riding, provided, of course, that the character of service is improved in proportion to the increase in fare. I am convinced that a 10-cent base fare standard is justified and necessary to insure a character of service that can successfully compete with the automobile.

Looking back over the past year, there have been many interesting and encouraging developments. Many of these have already shown promising results in the way of increased revenue, better public relations and reduced costs. But in my opinion the industry has in large measure only begun to develop the possibilities of meeting the demand for better transportation. Look at our cars, our track, our schedules, our fare structure; the deportment and performance of our men, our advertising, our relations with the public we serve, our interruptions to service, our maintenance facilities and methods—in fact, every one of the multiplicity of divisions of our property and activity. Would any manager contend for a moment that he had reached the limit of improvement in any one of these important factors that, taken together, determine the character of our service? Perfection must be our ideal—or as nearly perfection as it is humanly possible to accomplish. Only then can we afford to rest on our oars. Only when we have completely exhausted the possibility for improvement in every one of these elements of our service are we even for a moment justified in admitting that the automobile has us on the run.

Public transportation is a conservator of expensive street capacity. Let us not forget that and let's not miss a single opportunity for driving it home in the minds of the public. Public transportation also provides a ride for only a small fraction of the cost in an automobile. These are two of the fundamental economic facts that form the foundation underlying our industry. By being determined to win out we can find the way of putting public transportation once again on a really profitable basis. The electric railway industry must and will go forward—and that is in the direction of meeting more nearly than we have done in the past the modern standards of transportation service.

In the solution of present-day problems, particularly that of meeting the demand for better transportation, manufacturers as well as operators have a direct responsibility. In certain respects, the manufacturer has been somewhat backward. But by no means has this been entirely the builder's fault. Some of the responsibility for the manufacturing situation lies directly at the door of the operators. Nevertheless, even the builders have been slow to recognize the great need for development and improvement of the street car. They have shown some evidence, like many operators, of lacking faith in the industry of which they are a part. Indications are that this situation is changing rapidly and that we shall

soon have available for the job of meeting the demand for better transportation a wide selection of cars designed and developed to meet today's critical requirements.

There are many factors which have held back the improvement of the street car. By this I do not infer that car and equipment design and construction have stood still, for that would not be true. There has been substantial progress in construction and in weight reduction. Reduced costs and improved efficiency are important, but they are not enough. Attention to the ride selling features of design and equipment are equally or even more important. Even in structural design, however, recent developments indicate that we have been bound too much by the limitations of habit and precedent.

A discussion of the year's progress would be incomplete without some reference to the part which the bus plays in providing public transportation and in the advance that has been made in finding its place in the general transportation scheme. Much of the novelty and glamor of the bus has disappeared, and we have broadened our viewpoint considerably during the year so as to see the bus in proper perspective.

Even those who are enthusiastic regarding the field of the bus have come to see the folly of advocating a country-wide replacement of cars with buses. I have little patience with a discussion of buses vs. street cars. I think such discussion narrows the perspective of both car and bus men. I believe strongly that the bus will play a constantly increasing part in providing public transportation, and that it affords a railway not only a new flexible tool with which to meet some of its operating problems, but also a different type of vehicle with which to develop new classes of service and revenue.

Bus manufacturers have nearly all come to realize the value of this broadening of the bus field, which is the outgrowth of the policy of co-ordination. In my mind, the bus has a large place in the program of meeting the demand for better transportation. Its development and application were hindered rather than helped by those unfortunate instances of unsound sales policy which have now almost entirely given way to a policy of co-operation with existing carriers.

It takes courage to do the things that are necessary to meet modern conditions. It takes faith in the possibilities of the transportation business. But we have no choice. We must either move forward or pass out of the picture. The American people want something more in transportation than we have been accustomed to provide. I am convinced that they are willing to pay for what they want provided the transportation men of the country grasp an adequate conception of today's transportation demands. When I say that all this requires courage, I do not infer that transportation men have lacked courage in the past—they have faced conditions and encountered obstacles that many times seemed to be overwhelming. They have had the courage to hang on when the transportation situation seemed hopeless. But I am talking today about a different kind of courage; the courage to go ahead, to spend more good money in developing a character of service to meet present-day conditions.

Admittedly, public transportation has been a most important factor in the development of modern American communities. It is inconceivable that they can continue to develop without efficient service of the kind we are struggling to give. In that one basic fact lies the justification for our confidence in the future. Today's problem is one of developing the character of our service so as to win the public support necessary to its financial success.

Looking Ahead

In Meeting the Demand for Better Transportation

By R. P. STEVENS

President Penn-Ohio Edison Company



MR. STEVENS, first vice-president of the American Electric Railway Association, looks to the future of the industry with optimism. For each difficulty encountered by the railways, a compensating remedy has been found. The industry has lagged, however, in recasting financial structures that new capital may be obtained with which to make the physical improvements needed in meeting present-day transportation requirements.

In a large number of instances, bus operations at existing fare levels are not yielding a fair return on the investment. This is attributable partly to the fact that many such operations represent surplus service forced by the threat of competition or by public demand for the bus, due to its newness and novelty. In other cases losses which are experienced in bus operation offset heavier losses which would be experienced if rail lines were built to serve territory otherwise untouched.

On the other hand, it is apparent that many companies that have not yet adopted buses as an auxiliary to their street railway systems will be in the market for buses. With these purchases and the necessary replacements I do not anticipate that the requirements of electric railways will show any decrease in the immediate future.

It is becoming obvious today that some of the arguments on which the bus was promoted are unsound. It is becoming clear that the so-called "rubber urge" was merely the urge of novelty, and that the bus depends for its future on its ability to serve as another tool for meeting the demand for better transportation along with the street car and other forms of public transportation. Several of the elements in that demand are becoming better understood. The public shows much more permanent interest in whether or not there is a seat for every passenger than in the presence of rubber or steel tires under the vehicle in which it rides. When properly applied on fare levels which will make this economically possible, buses afford the opportunity of meeting this demand in situations where franchise limitations or the pressure for minimum fares make it impossible to give such service on street cars. There have also been developed in Pittsburgh, Washington, Kansas City and elsewhere examples of an entirely different standard of public transportation with buses at rates of fare approximating 5 cents per mile that show an attractive trend toward profits, and which promise

I HAVE optimism as to the future of electric railways, because I feel that we are "over the hill." The post-war era of transportation difficulties is fading rapidly into an experience of the past. A very optimistic statement, yes, but to me the vision is clear enough to justify it. For every blow that the electric railways have received a remedy has been found promptly, and we have now reached a period where economies can count as a net credit rather than as mere offsets to deficiencies.

For the high cost of labor following the war we found one-man car operation to be the remedy. For the high cost of equipment we found lighter cars with lower first cost and maintenance. The "jitneys" have practically disappeared, to be replaced by the motor bus, which is just now finding its place in the scheme of things. We are taking advantage of it to round out and co-ordinate the transportation system of the community.

From a survey of the bus situation, based on the opinions of reliable operators in every part of the country, it appears that the trend continues this year in favor of the operation of more buses by electric railways. There is a notable uniformity of opinion that these buses will not be used to supplant electric cars, but rather to supplement the existing street railway service. We find independent operations assuming a position of declining importance, especially in city service.

considerable extension of this type of express, de luxe operations. In the field of special party, sightseeing and chartered service, the use of the bus shows an encouraging tendency toward rapid extension on an attractively profitable basis.

With this problem in a fair way to be solved, we have to turn to such matters as public relations and financing. When I think of public relations, I think largely in terms of partnership—getting partnership interest has been done with great success in the electric light and power field, an activity that has changed the sentiment of the entire country toward that industry. It insures the efficiency of private ownership and operation uncomplicated by politics, and at the same time enlists public support and friendship by the very fact of local public ownership in its senior securities, generally preferred stock.

So-called customer-ownership campaigns have been attempted in the electric railway field with success, but only in a few instances. It seems to me that if we would profit by the great success of our sister electric industry we should take greater advantage of this opportunity. I suggested this thought a short time ago to two different operators, and received practically the same answer in substance, viz., "our financial set-up will not permit the sale of a sound preferred stock and, of course, we cannot and will not try to sell a preferred stock unless it is a sound investment."

At the 1925 convention of the American Electric Railway Association, at Atlantic City, the committee on electric railway financing, after many months of work by some of the best financial authorities in this country, submitted a report on electric railways. It was generally accepted as constructive and very valuable to the industry, but in the two years that have elapsed since that report was submitted I have heard of only two companies that have taken advantage of the suggestions contained therein. I thoroughly agree with the answers that were given to me by the operators mentioned above, namely, that their present set-up will not permit a sound preferred stock financing, but the answer to this is "change the set-up."

The electric railway industry, in my opinion, is suffering more today from antiquated financial structures than from any other single cause based on present-day conditions. I know of no industry that is more susceptible to improvement. The electric light and power people, largely through customer-ownership campaigns, have changed the whole attitude of the American public toward this industry. Our industry has the same opportunity.

In the recent past we have had our back to the wall, making a desperate fight for existence. Not the least of our trouble was the fear of what the bus business was going to do to our electric railway transportation systems. Now, I believe, this bugaboo has been exploded and, instead of being a bugaboo, the bus can be used to great advantage for the development of electric railway transportation systems as a co-ordinated adjunct to them. In order to take full advantage of this opportunity and before we can expect the fullest results from our efforts, I believe we must give more attention to our financial structure and must put ourselves in a position where we can raise the funds necessary for improvement of our properties. I believe the far-sighted management that will take full advantage of the opportunities for financing, for improving public relations, and for application of operating economies, will open up an electric railway future that few of us ever dared hope for.

Why Not Grasp the

Transportation executives can take the lead in meeting the demand for better transportation by championing the broad interests of the community. Conservation of street space is essential to the reduction of congestion

By L. S. STORRS

*Managing Director
American Electric Railway Association*

IT IS not necessary to review the changes that have taken place in the transportation business during the past few years to prove that it is on the way toward a complete rejuvenation. Proof is not lacking that there has been a marked improvement in many of the underlying fundamentals that form the economic foundation of the industry. Nor is it difficult to trace out and show that the industry's troubles during the past decade or more were caused by the fact that it built originally upon an unsound economic structure. In the fire of experience and difficulty, this foundation has been crystallized into sound principles, upon which the industry's future is now being built, secure as never before. Finally, there has grown, out of necessity, a changed point of view regarding the relations between a transportation company and its patrons; an understanding of the methods and practices that must be used in meeting the changed situation brought about by an automobile-educated public.

The industry itself and the public which it serves have made truly remarkable progress during the last several years in coming to agreement on sound principles of partnership. The record of the cities that have completely changed the basis of relations with their transportation companies is impressive, when consideration is given to the relatively short period in which strife, bickering and misunderstanding have given way to cordial and constructive co-operation. New York is the outstanding exception to what is rapidly becoming the general rule throughout the country, and present indications are that unless very material improvement is shown there soon the leading city of the country, in point of size and wealth, will be the last city of the country to apply intelligence and sound reason to the solution of its transportation problems. That the country's metropolis is paying a staggering price for its orgy of political nonsense is evident even to the most casual observer. Just how long intelligent business men and civic leaders of that city, to say nothing of the long-suffering public itself, will continue to put up with political expedients that are economic absurdities is an interesting test of human endurance and patience.

The record of important cities in which there has been an almost complete reversal of fundamental franchise conditions during only the last few years is a long one. Just a few will suffice to indicate the extent of this fundamental improvement, which now awaits only the spark of an increased riding habit to put the industry into a definite boom period. Pittsburgh, Cincinnati and Kansas City illustrate the point I am making. Stagnation,

Ideal of Perfect Service?



bankruptcy and chaos have given way in those cities to sound franchise conditions, public partnership and orderly improvement. There are many other similar examples, but these will suffice as typical. In two other large cities conditions are still unsettled, but an intelligent effort is being made to find a solution and there is little doubt that these two important communities will soon join the other cities that have definitely started on the road to progress. New York lags behind the entire country.

Much has been said about the mutual interests of communities and their transportation companies. Two things have been definitely established in this country: First, the absolute dependence of communities upon efficient transportation as a necessity to their existence and continued growth; second, that though privately financed and operated transportation companies have made mistakes and have not always used proper foresight in shaping their relations with their passengers and with the communities they serve, public ownership, in the few isolated cases where it has been tried, has shown no improvement whatsoever, and escapes complete chaos and stagnation only in so far as it retains some of the characteristics of private management and a personnel trained under private initiative instead of political chicanery and "buck passing."

The man on the street has a better understanding today of the fact that efficient, reliable and comfortable service are dependent on making the conditions of partnership between company and city such that the transportation company can remain solvent and be able to finance improvements and extensions needed to keep up with a city's changing requirements and growth. But

our industry has in a sense marked time during the past few years, while this necessary change in public attitude was developing. In the meantime the automobile made such strides in popularity that though the industry now stands on a better foundation of public understanding, there is much work to be done in making up lost time in winning increased patronage by application of modern merchandising methods.

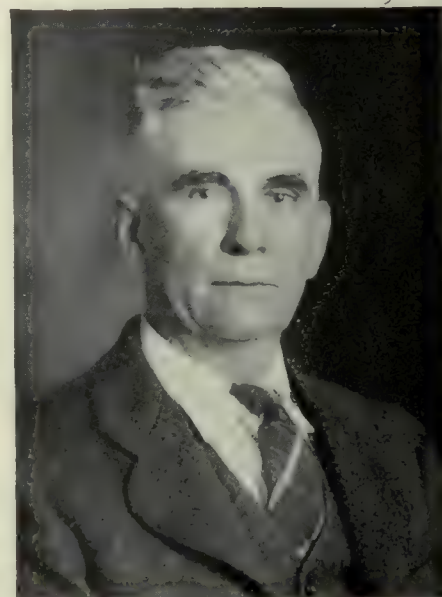
The industry will fulfill its destiny only as it rises above the conception that the transportation executive's task is merely the efficient operation of cars and buses. Under today's conditions it is far more than that. The vision of our executives must transcend the limits of a strictly company viewpoint. They must come to see clearly that the greatest service to their companies will be rendered through an understanding of the community's needs. From this will grow a broader conception of the entire community transport problem. It will ripen into new public confidence and real community co-operation.

Traffic congestion continues to be a baffling problem. Business men and politicians alike have been almost helpless in coping with it. Real leadership in showing the way to traffic relief will win for our industry a degree of public good will that will in turn bring inevitable success. But that leadership can be won only by demonstrated sincerity of purpose. This must be supported by expert knowledge of traffic matters, not only as they apply to public transportation companies, but also as they affect all users of the public highways.

In the increased use of public transportation and decreased indulgence in the luxury of individual transportation lies the logical solution of traffic congestion. But to bring this about there is one requirement of paramount importance. The character of public service must be brought as nearly to the level of that provided by the individual vehicle as is physically and economically possible. Only then can the public at large be expected to understand fully the importance of fostering the development of the best possible public transportation service. Transportation men must have as their objective the ideal of perfect transportation service. Each type of vehicle which is found suitable for rounding out this service in the best interest of the community should be developed and applied to the limit of its possibilities. The commutation service of railroads, rapid transit lines, large cars and trains for trunk lines on the surface, lighter cars in smaller communities and less densely populated territory, various types of buses for the classes of service in which they are most suitable, and perhaps taxicabs as well, should all form part of a city's co-ordinated transportation service. These various classes of service and different kinds of vehicles should be operated in the interest of giving maximum usefulness of existing street facilities. In fact, there seems no good reason why the movement of freight and commodities over city streets should not likewise be co-ordinated with the movement of passengers in the interests of bringing about maximum street usefulness with minimum interference and waste. All of these factors, to my mind, should be considered in the broad problem of meeting today's demand for better transportation.

Prize Winners in ELECTRIC RAILWAY

FIRST Capital Prize of \$200 awarded to James A. Duffy, superintendent of equipment Monongahela West Penn Public Service Company. Second Prize of \$100 goes to Joseph Mercier, general foreman of the track service division, Montreal Tramways. Third Prize of \$50 was awarded to Charles Herms, general foreman San Diego Electric Railway, and a Fourth Prize of \$25 was given to E. M. Miley of the Chicago Surface Lines. Prize-winning articles are published on pages 532 and 533 of this issue



James A. Duffy, the winner of the first capital prize and the monthly prize for August in *ELECTRIC RAILWAY JOURNAL'S* Maintenance Contest, is superintendent of equipment for the Monongahela West Penn Public Service Company with headquarters at Fairmont, W. Va. Since 1919 he has been in this position, to which he came from the Pennsylvania-Ohio Electric Company, Youngstown, Ohio, where he was master mechanic for seven years. Mr. Duffy was also master mechanic of the second division north side shops of the Pittsburgh Railways for seven years.

He is a Pennsylvanian by birth and was educated in the schools of Fayette and Jefferson Counties. His first experience was in the coal mines in Pennsylvania, where he was engaged in installing electrical mining machinery.

Mr. Duffy has had considerable power plant experience in addition to his railway equipment work. He was with the Duquesne Traction Company, Pittsburgh, and later with the Fifth Avenue Traction Company of that city, where he served as power house engineer. Later he was made assistant chief engineer of the company's power plant. In 1899 Mr. Duffy went to the Havana Electric Railway, Havana, Cuba. There he was engaged in constructing power plants, overhead lines and equipping the street cars of that company.

EQUIPMENT arranged for building up the treads and flanges of car wheels by electric welding with provision for grinding the wheels to proper contour at the same time was awarded the first capital prize of \$200 in *ELECTRIC RAILWAY JOURNAL'S* Maintenance Contest. This item also received the monthly prize of \$25 for August. This equipment is used in the Fairmont, W. Va., shops of the Monongahela West Penn Public Service Company, and a description of the equipment, together with its economies, was submitted in the contest by J. A. Duffy, superintendent of equipment for that company.

Wheel work constitutes one of the principal maintenance operations on any electric railway system. The turning of steel wheels to provide a proper tread and flange contour when these become worn and the grinding of cast-iron wheels to get rid of flat spots have long been universal practice. The building up of the treads and flanges when they become worn by applying metal through the electric welding process is a more recent development. Many city properties are using this with satisfactory results and with desirable economies. Few high-speed interurban roads, however, have adopted the process because of a feeling that there might be danger of a derailment should the welding prove defective. The Monongahela West Penn Public Service

Company operates interurban service through a number of towns in West Virginia and Ohio and the restoring of treads and flanges by automatic electric welding is used. To save time and labor the special equipment described in the article was devised so that one wheel is ground while the other wheel is being built up by electric welding. Provision was made for driving the wheels at a speed desirable for the welding operation through gearing attached to the center of the axle, and a variable speed motor with proper control provides for variations in peripheral speed of from 5 to 13 in. per minute. The automatic welder is of standard manufacture and convenient mounting is attached as part of the equipment. The grinding wheel is driven by a separate electric motor.

This method of grinding and welding has eliminated the use of a wheel lathe and a saving of about three hours per pair of wheels in machinist's time has resulted. With this equipment the welder can do other kinds of hand welding at the same time that he is overseeing the wheel welding by the automatic head. The judges considered that this method provided for a decided saving in labor and expense in one of the most frequently occurring maintenance jobs with which electric railways are confronted.

A quick release latch for a hacksaw blade as submitted by Joseph Mercier

of the Montreal Tramways was awarded the second capital prize of \$100. This equipment is extremely simple, but fills a long-felt want in making it possible to remove the frame of the hacksaw quickly when a car approaches. This obviates the necessity of removing the blade from the rail, which frequently results in

JOURNAL *Maintenance Contest*

breakage. This equipment provides a rigid hacksaw blade for doing the work and an instant release so that the blade can be left in the rail provided it will clear the wheel flange.

The third capital prize of \$50 in the Maintenance Contest went to Charles Herms, general foreman San Diego Electric Railway, for an adjustable mandrel to be used in babbitting journal brasses. This is the second prize that has been won by Mr. Herms in the Maintenance Contest, as he was awarded the monthly prize for June for a spacing attachment used with a commutator slotting machine. The babbitting mandrel described by Mr. Herms is arranged so that different types of journal brasses can be poured on the same mandrel while securing perfect alignment with the

axle and journal box. Side adjusting plates can be put in position quickly and so the time for the operation of babbitting is reduced considerably.

In previous announcements in the JOURNAL provision was made for but three capital prizes. In going over the large number of manuscripts submitted, however, it was found desirable to add a fourth prize of \$25 to the list for honorable mention in the articles considered for the capital



Joseph Mercier, the superintendent of the track service division for the Montreal Tramways, Montreal, Canada, was the winner of the second capital prize in ELECTRIC RAILWAY JOURNAL'S Maintenance Contest. He was born in New York State and began his electric railway service with the old Montreal Street Railway, now the Montreal Tramways. He has been in charge of the track service division since May, 1916. This division includes a machine and frog shop, where welding, grinding and similar work are carried on. In addition, a large amount of track repair equipment is maintained, such as bonding apparatus, crane cars, concrete mixers, tie tampers, concrete breakers, steam rollers, and other similar equipment used in the track construction department.



Charles Herms, who won the third capital prize, is shop foreman of the San Diego Electric Railway. He has been with that company since 1923. He began his electric railway experience in 1919 with the San Antonio Public Service Company in Texas as general repair man and continued in this capacity for four years, when he was promoted to foreman over a crew engaged in remodeling cars.

Mr. Herms has always been interested in mechanical construction. During the war he was attached to the First Army headquarters in a motor repair unit. Other experience outside of the electric railway field includes supervision of the mill department of the San Antonio Portland Cement Company and a position with the Boston & Superior mine in Arizona to recondition the electric and telephone system of that company.

prizes. This fourth prize goes to E. M. Miley of the electrical department of the Chicago Surface Lines for his description of the method used by that railway in reclaiming steel



E. M. Miley, the winner of the fourth capital prize, is estimating engineer for the Chicago Surface Lines. He started work for the Western Electric Company in Chicago in 1902 in the power apparatus testing department and later was promoted to shop superintendent. In 1917 he took the position of chief electrician for Hillman's Department Store in Chicago and later went with the Northwestern Elevated Railway, now included in the Chicago Rapid Transit Company. His work there was on substation construction work. In 1908 he went with one of the Chicago railways now included in the Chicago Surface Lines.

trolley poles by electric welding. With this method some 900 poles have been reclaimed, which has resulted in a saving of approximately \$27,000 from the cost of new poles. The method is also used for reinforcing poles while they are standing in the street under load. It should prove a valuable maintenance practice for adoption by other railways.

The equipment used for grinding and welding wheels at the same time was described in the Aug. 20 issue of ELECTRIC RAILWAY JOURNAL and was awarded the August monthly prize.

Honorable mention for August was awarded to Charles Herms of the San Diego Electric Railway for his description of an air clamp for drill press.

1923. Of this number 210 are of the light-weight, double-truck type designed for either one-man or two-man operation. Although it is difficult to estimate the savings in equipment, power and platform expense which may be credited to the new cars, there is no doubt that operating expenses have been reduced materially. It is even more significant that the gross revenue of the company has shown a substantial increase since 1923, as indicated below, despite a general business depression in this district. Expansion of bus service and fare increases undoubtedly have contributed to the gain in gross earnings, but improved car service has been an influential factor.

Revenue of United Electric Railways of Providence	
Year	Gross Earnings
1923	\$8,006,202.21
1924	8,179,822.41
1925	8,159,446.59
1926	8,193,345.17

Other New England cities in the 100,000-500,000 population class which recently have bought light-weight, double-truck cars are Worcester and Springfield. A total of 100 new cars were ordered in the early part of this year by the management in charge of the railways in these two cities. The first of these cars began operation early in August of the present year. After the entire lot has been put in service it is planned to retire much of the older, heavier equipment. Similarly, the Eastern Massachusetts Street Railway recently bought 50 cars of the same general type for use in the industrial cities, such as Lawrence, Lowell and Fall River, which it serves.

In the North Central states the Milwaukee Electric Railway & Light Company has placed in service 40 modern, double-truck, light-weight cars, in which control apparatus and air piping are



New light-weight cars of Nashville, Tenn., are named after prominent citizens of the state

entirely inclosed in cabinets made of a metal-faced wood. This gives a light but strong construction which will not become dented or de-faced as easily as wood and can be re-finished readily. An opening provided between the two sections of the cabinet gives kneeroom for the operator. Interior trim is light cherry with a cream color ceiling. The exterior color scheme is orange and cream, the orange being placed in the panels below and above the windows with cream in between them to give a streamline effect. Aluminum fittings are used throughout for seats and handrails. Seat cushions and backs are upholstered in the customary rattan, which is covered with hair felt ½ in. thick, and a final cover of black Kemi-suede. The first cost of this seat is slightly higher, but it is claimed that its life is greatly increased.

The chief function of a railway company is to sell rides at a profit and success is dependent on creating demand through improvement of the product. Replacement of obsolete equipment is of paramount importance and should be given serious consideration. Application of the same principles that cause a merchant to pay careful attention to the appearance of his store will attract new business and make more friends for the railway. Modern cars attract greater patronage and earn more revenue than those of obsolete design.

While light-weight, double-truck cars of the type discussed lend themselves most admirably to service in cities of 100,000 to 500,000 population, they are in successful

use in cities of more than 500,000 inhabitants. There are light-traffic lines even in the largest cities, and a double-truck car of medium size, economical to operate, is more efficient for this service than a bigger vehicle would be. Then, too, there are many routes where the traffic is fairly heavy in the smaller cities. The light-weight, double-truck car is well suited to such conditions.

Properly used it is an important factor in restoring the popularity of the electric railway.



Light-weight cars at Providence, R. I., have reduced operating costs and increased earnings



Front-entrance, center-exit car of the United Railways, St. Louis, is well adapted for handling heavy loads

Heavy Traffic in Major Cities Demands

Large Double-Truck Cars

By R. J. LOCKWOOD

Assistant Manager for Receiver United Railways of St. Louis

FROM the standpoint of the street railway operator the field of urban passenger transportation has become vastly more complex during the past few years. Not so long ago it consisted of subway, elevated, street car and suburban steam railroad services. In those days the street car operator was not confronted with the problem of serious competition, the field being somewhat distinctive. His concern was largely with the financial and engineering problems of increasing and extending his service to meet the expanding needs of growing communities. Today, however, his problems are more complicated as the forms of urban passenger service have increased until now they include subways and elevateds, large double-truck street cars, smaller one-man cars, double-deck buses, single-deck buses, taxicabs and, last but not least, private passenger automobiles. Each of these types of transportation undoubtedly has its own particular field, but actually they are not bound by exact economic limitations and in many instances their services overlap. Thus competition and unnecessary traffic congestion follow, with all their attendant ills. It is the purpose of this article to discuss the large double-truck street car and its field of operation and to touch upon other services only where comparison with the large car is needed.

Undoubtedly the large street car has a most useful field of operation, particularly in handling mass transportation in cities where the travel spreads out in many directions and does not follow a restricted line of flow, as in the Borough of Manhattan. Such a city, for instance, is St. Louis, containing in its metropolitan area about 100 square miles and a population of approximately 1,000,000. Other similar cities are Chicago, Philadelphia, Cleveland, Detroit, Baltimore and Cincinnati.

In St. Louis about 30 per cent of the population coming from the entire metropolitan area travels each day into the congested district, comprising an area about $\frac{1}{2}$ mile square. Later each day the 30 per cent assembled in the congested district travel home again, their routes of departure radiating like the ribs of a fan. In addition to this, about the same number of people travel each day to and from various other points of the city. To handle such travel on subways would require the construction of so many miles of line that the proposition would be prohibitive in cost. Because of street traffic congestion in the central business district, it might be desirable to put the surface cars underground for relatively short distances, but present traffic at present fares does not furnish revenue enough to justify such a proce-



Borough Hall, a heavy traffic point on the surface lines of the Brooklyn City Railroad

ture unless the people are willing to pay for it by taxation. Even then the large double-truck street car would not be replaced, but merely would be operated on an underground right-of-way for a minor portion of the trip.

From data available it is apparent that in the large cities the street railways are handling about two-thirds of the urban passenger travel. Interesting figures from a survey made in St. Louis in 1925 are presented in an accompanying table showing that 63.5 per cent of all passengers are carried by the street railway. Cordon

counts made at Baltimore, Md., for successive years show that the street car continues to be the most important passenger-carrying agency. A survey in Detroit, the so-called "home of the automobile," showed 62.4 per cent of all rush-hour passengers using the electric railways and an all-day count in Los Angeles, which claims the greatest automobile saturation, showed 61.3 per cent. A check made in Cleveland last year at 23 of the largest stores indicated that 64.2 per cent of the customers came by street car. It is in such cities as these that the large double-truck car is still essential.



State Street, Chicago, where the bulk of the traffic is handled by the cars of the Surface Lines

Undoubtedly the gasoline vehicle has slowed up what used to be the normal yearly increase in street car travel. It has hurt railway pleasure travel more than business travel. This is indicated by the fact that in St. Louis week-day travel in 1926, compared to 1925, increased 0.18 per cent. Saturday travel decreased 0.16 per cent. Sunday travel decreased 2.35 per cent and other holiday travel decreased 2.42 per cent. Night travel on all days also fell off. The foregoing figures indicate beyond doubt that the greatest competitor of the street car is

been made. The large double-truck street cars built 25 years ago were heavy and cumbersome. During the years 1903 and 1904 the St. Louis Transit Company and the St. Louis & Suburban Railway, predecessors of the United Railways, bought about 525 cars of this type. They are typical of many built in that period. Their principal characteristics are given in the table below, as well as those of 200 cars built by the United Railways from 1921 to 1923.

It is readily seen that the newer cars are much



Seventh and Broadway, Los Angeles, showing large cars used in city service

the privately owned automobile. Not only has the normal growth of the street car business been curtailed but the loss at periods when it is easiest to furnish transportation makes the problem even more serious.

To meet present-day competition, whether from the bus or the private automobile, there are certain broad principles that the railway manager must adopt for his guidance. There are many little things which can be done with more or less success, such as publicity stunts, etc., but in the long run the fundamentals are:

- Give as frequent service as revenue will permit.
- Keep the cars on schedule and equally spaced.
- So far as possible provide a seat for every passenger.
- Establish as fast a schedule speed as possible with proper regard for safety.
- Use plenty of paint to make the cars look attractive.
- Keep the cars clean.

To accomplish these things is no easy task, because the street railways are a regulated industry and the public authorities controlling them have been slow to recognize their difficulties. Nevertheless progress has

more efficient than those built twenty years before. In acceleration, in smooth running, in energy consumption, in weight per passenger and in convenience of loading and unloading they are far superior to the older cars.

	Cars Bought 1903-04		Cars Bought
	St. Louis	St. Louis	1921-23
	Transit	& Suburban	United
	Company		Railways
Length	46 ft. 2 in.	48 ft. 5 in.	50 ft. 6 in.
Weight	48,800 lb.	52,000 lb.	39,400 lb.
Seating capacity, passengers.	57	57	60
Standing capacity, passengers.	60	50	60
Weight per seated passenger.	856 lb.	912 lb.	657 lb.
Weight per total passenger.	417 lb.	486 lb.	328 lb.
Kilowatt-hours per car-mile.	3.219	3.343	2.826
Motors	4 40 hp.	4 40 hp.	4 35 hp.
Diameter wheels	33-in.	33-in.	26-in.
Height of floor.....	39-in.	39-in.	31-in.

Data are available on 6,273 double-truck cars purchased by 55 companies since the World War. These

figures are not so complete as those on the older and heavier cars, but they are interesting:

4,041 cars weigh less than 40,000 lb.
2,231 cars weigh more than 40,000 lb.
6,273 cars average 36,100 lb.
4,624 cars have wheels of 26-in. diameter

From these figures it will be seen that the typical modern car is a very different vehicle from that in use twenty years ago.

During the past two years certain radical departures from established practice have been made. At the Cleveland convention of the American Electric Railway Association in October, 1926, the Cleveland Railway exhibited an aluminum car which was 51 ft. long, weighed 30,000 lb. and seated 49, with standing room for 91 additional passengers. It is commonly believed that aluminum will soon come into more general use in car construction than at present. At Springfield, Mass., and at Joliet, Ill., two worm-drive cars are in service. These cars are light in weight and are somewhat experimental in their construction, in that the axles are those made by the Timken-Detroit Axle Company for heavy truck service and the motors used were designed and built for gas-electric bus service. Similar trucks have been ordered by St. Louis for one car, by Pittsburgh for two cars, by Detroit for one car and by Montreal for two cars. The St. Louis truck and probably the others will have rubber shock absorbers on the ends of the springs and a rubber insulation between the wheel center and tire, with connecting bonds to complete the electrical circuit to the track.

Advantages of these innovations are expected to be in smoother and quieter running of the car. Brake screech and clatter, wheel ring, journal box, gear pedestal and

bolster noises, and general noises due to vibration, it is confidently expected, will be eliminated or much reduced. In St. Louis a special body is being built using aluminum to some extent. This car will have the load-carrying capacity of the front-entrance, center-exit car described earlier, but it is to weigh 5,000 lb. less. Thus by improvement in the design of large cars for heavy city traffic it is to be expected that a vehicle will be developed which will meet the demands of this kind of traffic and provide better and more attractive service than is being given at present.

According to the census of 1920 there were sixteen cities in the United States having populations in excess of 400,000. Several other cities were so near this figure that it is safe to say that there are now twenty cities in this class. They constitute the primary field for the operation of the large double-truck car. Of these cities, New York, Chicago, Philadelphia and Boston have more or less extensive rapid transit systems. But this has by no means eliminated the large car as a factor in their local transportation facilities. It is a fact not generally realized that surface cars are carrying more than 40 per cent of the total traffic in New York City, despite conditions that are more favorable than exist anywhere else for the development of rapid transit; large surface cars are used intensively also in Chicago, Philadelphia and Boston, and in the cities without rapid transit vehicles of this type are carrying the bulk of the traffic. In cities of less than 400,000 population the large double-truck car can sometimes be used to advantage on certain lines. Generally speaking, however, its field of greatest usefulness probably will be found in the twenty largest cities, particularly in those where geographical and other conditions are unfavorable to the development of extensive rapid transit systems.



Large surface cars play an important rôle in Philadelphia's transportation system

Congestion Demands Use of

Surface Line Trains

For Economy

By EDWARD DANA

General Manager Boston Elevated Railway



Three-car multiple-unit surface train operated by the Boston Elevated Railway on Commonwealth Avenue

SO MUCH has been said and written in recent years regarding theory and practice of surface-train line operation that the fundamental principles of success in this field are generally understood. The practice of adding cars to an operating unit to care for greater volume of traffic dates back to the beginning of large-scale transportation. Steam railroads have practiced it as far as possible, because with them each train unit requires a locomotive. Conditions are entirely different in street railway operation, but the same fundamental principle applies, namely, to furnish the desired service at a minimum of cost.

City surface-line operation is distinguished from others by certain characteristics, the main one being the interference of vehicular traffic with car movement. Another is the demand of patrons for frequent service, and a third is the relatively short distances between stops. All of these factors unite to render difficult the maintenance of uniform headways, particularly in rush hours. That is where the train helps to solve the problem.

The increasing use of trains of two or three cars in surface-line operation in large cities is due to the application of three general principles:

1. A train of cars permits more rapid operation through congested traffic than do separate cars. This follows because all of the cars in the train go through traffic as a single unit. Other vehicles can interfere less with a train than with a corresponding number of single units, and a single signal from a traffic officer assures passage of the entire train. The tendency of single units

in heavy traffic is to bunch; in other words, they are forced to form what is essentially a train. This is a condition which suggests train operation.

2. When passenger traffic on a given line is sufficiently heavy to permit train operation without too great an increase in headway, trains can be operated at lower labor cost per car-mile than single units. One motorman operates a train of any desired length, hence the share of his wages chargeable against each car is inversely proportional to the number of cars in the train. This comparison is, of course, with two-man cars, which would usually be operated under traffic conditions favorable to train operation.

3. The train furnishes a flexible transportation unit, the capacity of which can be readily adjusted to service requirements. Whether trains consist of multiple-unit cars or motors and trailers, it is practicable to add or drop cars as the traffic demands and thus keep the equipment in service efficiently.

EXPERIENCE IN BOSTON

The first regular two-car train operation in Boston was inaugurated on May 24, 1915, on the line from Watertown to Park Street, although experiments along this line had been tried earlier, perhaps 25 years earlier. This method of operation was introduced to utilize in rush hours the greater carrying capacity of the train, with lower platform costs, on lines where the headway under train operation is not detrimental to the service. The first trains consisted of motor car and trailer, involving, of course, provision for looping trains at the terminus of the line and ample kick-off tracks for the storage of the trailers. The arrangement offered opportunity to purchase equipment at minimum expense, because the trailer is so much lighter and, being without



Pittsburgh Railways operates many multiple-unit trains during the rush hours. These are disconnected and operated as single cars during the day

motors, so much less expensive than the forward car. It so happened that by slight changes in motor cars which had not originally been purchased to haul trailers it was possible to introduce train operation without expensive changes in our so-called No. 4 type motor car.

At the present time there are 220 trailers on the Boston Elevated system operated on fourteen lines. Shortly after the successful installation of train units the center-entrance multiple-unit car was introduced and today there are 190 of them on the system, running as trains in two or three-car lengths on eight lines. Experience with center-entrance multiple-unit train operation has shown that dead mileage can be reduced to a minimum by trains that can be turned back on crossovers, not requiring the expense of installation of loops or the operation of the two-car units to the end of the line.

Recently on a heavy crosstown line where traffic congestion had become so extreme that individual cars were running practically in trains the introduction of two-car train rush-hour service has equalized the load and improved the service without seriously impairing the frequency of the service. Conditions at the Park Street loop of the Boylston Street subway, a heavy main artery, are such as practically to demand rapid transit operation. A close approach to this could be obtained only by two and three-car trains. During the rush hours all lines passing through this tube are operated in either two or three-car-train units, which makes it possible to pass a greater number of cars through Park Street station than would be possible with individual units and individual operators.

Under favorable conditions it ought to be possible to utilize multiple-unit trains somewhat after the fashion of steam railroad operation, where cars are picked up at

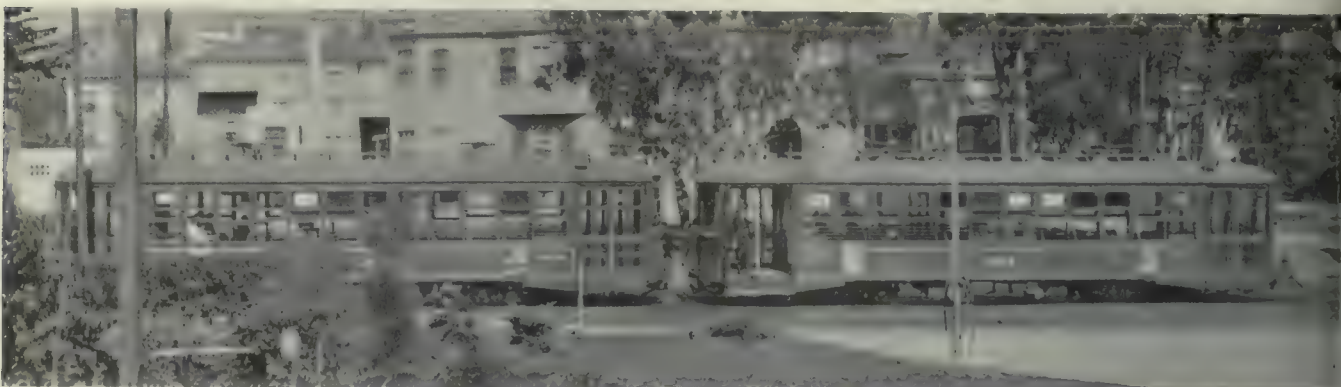
certain major points. This has not yet been tried in Boston because of the relatively short length of the lines leading to rapid transit terminals, but there is a field for such operation, because it gives most economical distribution of the seating capacity. However, careful studies are required in advance to determine the proper fields for it.

After the East Boston tunnel, originally built for surface car operation, reached its saturation point with single units, it was speeded up materially by the introduction of surface-car multiple-unit trains. After again reaching its saturation point it was converted into a rapid transit steel-train line. Had it not been possible to use the surface-line trains the expenditure for transforming the tunnel into a rapid transit tunnel would have come very much earlier than it did.

In the handling of large crowds, such as at baseball games and circuses, we find train operation of inestimable value, because a maximum amount of service can be rendered without calling upon regular men for a great deal of overtime work.

It is easy to go too far in the extension of train operation, because headways can become too long if a certain economic limit is exceeded. Just what this limitation is depends largely on local conditions and must be determined on the basis of accurate traffic studies. Patrons are entitled to a certain frequency of service, which of course depends in part on the business handled by the line. Sometimes, however, service must be given locally at a loss in order to insure reasonable standards.

In considering train operation, it is necessary first to determine the loads carefully. For purposes of comparison several sets of data must be worked out to calculate



Train operation has been found to have many advantages on the lines of the Key System Transit Company

suitable headways with single-unit operation, with various combinations of short-line service, partly with trailers and partly with single cars, and with various train combinations, covering the entire length of the line. It is surprising to note from any set of traffic load figures the number of variations which must be studied before a final decision can be made. Such determination includes the best arrangement of train operation, if such operation is justified at all. In this connection the probable change in the complexion of the line must be given very careful consideration, because if the center of gravity of traffic should change by even $\frac{1}{2}$ mile the relative values of these various combinations would be quite different.

While our experience in Boston may be considered typical, other localities have different conditions which

nal after the front end of a train receives a "go" signal, regardless of whether changes are made in the "stop" position or not. The "skip-stop" has been helpful in connection with train operation. To secure equal loading of the cars of a trailer train, as is secured on the articulated units, remains somewhat of a problem.

This company also uses 24 cars permanently coupled to form twelve two-car trains. This is an economical arrangement from the standpoint of equipment, but the company has been so successful with its articulated trains, with their lower platform labor costs, that no more trains of this type will be built.

The Key System Transit Company at Oakland, Cal., operates three distinct classes of service involving trains, namely, motor-trailer operation, multiple-unit street railway two-car trains and multiple-unit trunk-line



Chicago Surface Lines has found the reversible feature of multiple-unit trains to be of great advantage

affect the use of trains. In the preparation of this article valuable co-operation has been received from several managers and their experience will be summarized briefly:

At Baltimore the United Railways & Electric Company has 62 cars equipped for multiple-unit train service. Practically all of these cars are of the "pay-enter" type, operated on the high-speed Sparrows Point-Bay Shore Park line. Peak-hour service on this line is nearly all given with two or three-car trains, made up in various combinations, i.e., one motor car and one trailer, two motor cars, two motor cars and one trailer, or three motor cars. The line is double-track, 16 miles long, largely on private right-of-way, with three fare zones. The company considers this one of its most successful lines.

The company also operates motor car and trailer trains on six one-fare city lines. Trailers are operated only in the morning and evening peak hours. At first the motor cars were underpowered, but early this year they were completely remotored, with four 65 or 67-hp. motors each. This operation is now entirely successful. The company owns a total of 100 trailers.

Saving of labor is considered to be the main advantage of train operation, but incidentally there are also savings in power and in accident costs. There is an increase in track capacity because automobiles cannot get between cars of a train. In congested districts service is speeded up because the entire train can proceed past a traffic sig-

trains. The first of these is not entirely satisfactory, requiring a wye or loop at the end of a line and lacking flexibility in coupling up and cutting off. It is not conducive to making as good time as is secured with the multiple-unit trains. Local interurban service is furnished with one and two-car units built up and cut down to meet the requirements of traffic during rush hours. The cars are equipped with automatic couplers. The trunk-line service consists of trains of one to thirteen cars with automatic couplers, built up and cut off to meet the requirements. They are operated intact over the trunk line and cut at three points beyond it. The first section is operated express, the second is diverted to another route and the third furnishes a local service over the route traversed by the express. Cuts are made while the train is in operation without loss of time. On the trunk line the company is operating as many sections as can be accommodated, hence it is necessary to operate trains intact over that section and cut them after they branch off.

Experience on this system shows that train operation reduces accidents, eliminates congestion in streets, decreases man power with the same carrying capacity and is convenient, expeditious and flexible. The use of automatic coupling is an important feature in operation on this system.

Multiple-unit trains are operated on only one line by the Cleveland Railway—a rapid-transit line built into an outlying residential section. This type of operation

gives more rapid acceleration than is possible with trailer trains and there is smoother operation. For this service 25 cars were rebuilt for multiple-unit operation and geared for about 40 m.p.h. They are operated singly and in two and three-car trains.

Trailer trains are operated extensively in Cleveland, all motor cars being equipped with four 40-hp. motors. This equipment is not too large for single-car operation and is sufficient for train operation during the rush hours. Cleveland is very flat and there is little overheating of the motors during the few hours of trailer operation. The motor cars weigh $22\frac{1}{2}$ tons and the trailers 13 tons. At present in the evening rush hours a maximum of 792 cars and 432 trailers are scheduled. All heavy lines operate trailers morning and evening, the duration depending on the length of the line and the loading char-

cars include one-man and others that operate singly. Of this equipment the dead trailer is the least satisfactory and it is the intention of the management eventually to motorize all trailers. The operation is jerky and the large and heavy cars equipped with over-size motors necessary to haul the trailers are uneconomical. Since the trailer is used only four or five hours a day ordinarily, the operation of these heavy cars during the base schedule hours is costly.

The multiple-unit train has the advantage of greater acceleration on grades, which is important in Pittsburgh, where a few of the grades are as steep as 10 to 12 per cent. In such districts the multiple-unit equipment is the only kind that would stand up for a long period. The ability of the multiple-unit equipment to operate for a longer period without harm to the motor is an important



On the Euclid Avenue route, which is the heaviest in Cleveland, trailer trains are operated throughout the day

acteristics. On the Euclid Avenue line, the heaviest of the system, trains are operated all day, but even here there is no danger of overheating of the motors. This company favors trailer trains because the investment idle eighteen to twenty hours a day is less.

On account of the short, narrow streets in Pittsburgh and lack of elevated or subway facilities the trains are made up of but two cars. These are operated only during the morning and evening peak hours, excepting Saturdays and holidays, when they are operated for periods of ten or twelve hours. Three kinds of trailers are used by this company in making up trains, namely, multiple unit, motorized and non-motorized. The multiple-unit cars contain four $37\frac{1}{2}$ -hp. motors each. The motorized trailer, which cannot be operated as an individual car, has two motors of 33 hp. each, and it can be operated only with a certain type of car containing four motors of $37\frac{1}{2}$ hp. each. When the two cars are connected they are known as a six-motor train. The dead trailer is operated only with a certain large and heavy type of car having four motors of from 60 to 75 hp. capacity each.

Of the 1,426 passenger cars in operation 155 are dead trailers, 380 are equipped to haul trailers, 160 are multiple-unit cars, 70 are trailers with two motors and 88 are six-motor-train motor cars. The remaining 573

one. It is also more flexible, a good operating feature around the carhouses, as it can be shifted under its own power. As trains are made up and disconnected twice a day, this is an important consideration.

Offsetting the disadvantages of train operation, i.e., longer headway, delay in getting starting signals to motormen and longer headways than with single cars, all of which are relatively insignificant, the Pittsburgh Railways finds, among the advantages of trains, smooth and comfortable operation, ability to handle surging crowds and smaller labor costs. As to types of trains, the multiple-unit type gives more service, is more durable and produces better acceleration.

The Chicago Surface Lines has 66 multiple-unit trains in operation on four heavy traffic routes and 95 trailer trains on three other similar routes. An advantage of the multiple-unit trains of special value in Chicago is that they are reversible at any point on the route, which minimizes interruption to service on account of fires, blockades, etc. A disadvantage is that the jumpers must be cared for when trains are disconnected on the street.

With trains composed of a motor car and center-entrance trailer it has been found in Chicago that there is difficulty in splitting up the load, as compared with the loading of multiple-unit trains where both cars are motor

cars and the loading is all done at the center of the train.

The San Diego Electric Railway operates multiple-unit trains in all scheduled runs on three suburban lines, operating on common track to a junction point 7 miles from the center of the city. Here the rear car is cut off and takes a branchoff, the second car being dropped at a junction point farther out. The remaining car continues to the end of the line. The three cars of a train are designated by three route numbers. The crew of the first car comprises a motorman and a conductor. On the second and third cars are conductors, who merely collect fares as the train is operating as a whole in either direction. Beyond the junction point the men on the second and third cars operate merely as motormen, not having to bother with fares.

Due to the use of automatic couplers, little time is

Taking into consideration the experience of these various railways it is possible to make a few general statements which epitomize the whole problem of surface-line operation. When traffic has reached such proportions that all efforts to meet it adequately by short-lining routes has resulted in track saturation which is impairing the efficiency of the service as a whole, then train operation demands attention.

Train operation cannot be considered, *per se*, as an economical move. The problem is more fundamental than merely securing economy of platform cost. Train operation should not be embarked upon without a careful study of all possible alternatives, such as rerouting or distribution through other channels of the traffic load involved. The introduction and the distribution of such service must be determined by the character of the traffic



Rush-hour service on the Sparrow's Point-Bay Shore Park line of the United Railways & Electric Company, Baltimore, is given by trains consisting of two motor cars and a trailer

required to make up or break trains at junction points, this being done in less time than is necessary to handle the passengers at these points. The coupling equipment is so arranged that it will make or break two air lines (main reservoir and brake), the bus, control and signal lines, all through the use of a push button at the motorman's position on the car. With this equipment a following car can be dropped under way, while in making up a train the mechanical connections are made by impact and the push-button connection performs the other operations. During periods of specially heavy traffic trains up to six cars are operated on this line to three beach resorts, the trains being made up and broken into groups for the several beaches.

San Diego is laid out with short blocks in the city proper, so that the congested area presents unusual traffic problems. With train operation better use can be made of the track due to the less space required as compared with single units and the better speed due to the grouping of units.

Experience in San Diego shows that for city service multiple-unit control is most desirable and successful when the equipment is such that the making and breaking of trains can be accomplished with a minimum loss of time; that is, by full automatic operation. Equipment requiring two jumpers for electrical connection between cars, previously used, caused considerable delay and car trouble.

handled and the work to be performed. Moreover, train operation on an all-surface-line system is markedly different from that on a system that has a backbone of rapid transit service or subways.

The manager who has finally decided upon the use of trains confronts the problem: Shall the trains consist of motor cars and trailers or shall multiple-unit equipment be used? In favor of the former are simplicity and lower equipment cost. In favor of multiple-unit equipment are greater traction and greater flexibility. There is no question about the greater flexibility of the multiple-unit train in its ability to meet varying traffic conditions and in the ease with which it can be modified as conditions change. The choice as between trailers and multiple-unit cars largely depends on original costs, the possibility of utilizing older equipment as trailers and whether the line under consideration is of major or secondary importance.

On main lines, with the possibility of operation in subways, our experience would favor multiple-unit train operation. On the other hand, on short lines of less importance the operating economics and lower first cost make it possible to adopt train operation with trailers where multiple-unit operation would not be justified. Accident hazards with trains are less than with single units, because the smaller the number of individual operating drivers, the more concentrated is the responsibility and the less the likelihood of collision and other accidents.



*Articulated units have proved economical
in city service in Baltimore*

Articulated Units

Are Useful for Mass Transportation

By S. E. EMMONS

*Assistant General Manager
United Railways & Electric Company, Baltimore, Md.*

IN THIS and other countries the cost of operating electric railways has been increasing so rapidly that every endeavor to increase sales and to reduce operating expenditure has deserved careful consideration. The dead weight per seat of modern cars is large, and any considerable reduction is of the utmost importance. The usual practice of employing two four-wheel trucks per car involves considerable unnecessary weight when the units are used for train formation. It was this fact that led car designers to develop the articulated principle of serving two adjacent car ends with one truck. Results have been extremely satisfactory, a saving of from 10 to 14 per cent being effected in two, three and four-car units, and savings of more than 20 per cent being obtained on the larger assemblages.

Articulated units have five distinct advantages: (1) Reduced first cost; (2) reduced weight; (3) reduced operating costs; (4) improved riding qualities, and (5) simpler electrical construction.

First cost is reduced because of the need for less equipment—trucks, couplers and other costly parts. With fewer trucks the construction is simpler, and this, too, reduces the first cost. Reduction in weight is effected by employing fewer trucks and other equipment and in doing away with vestibules at the adjacent ends of the cars in an articulated train. The saving of weight per passenger amounts to more than 20 per cent in some trains. Operating cost is reduced considerably because fewer men are required to operate an articulated train and the energy consumption is much less. Two cars, not joined, would require two men each, or a total of four men. The same two cars if articulated could be operated by two men, or just half the other number. With less weight and fewer trucks and other equipment, maintenance costs are certain to be lower, not only on the cars but on the track as well.

Improvement in riding qualities is very marked due to the fact that there is no overhang of the bodies beyond

the trucks, the adjacent ends of each body being carried on one truck center. The most comfortable part of an ordinary car body is that situated midway between the truck centers, there being a minimum amount of lateral movement when entering curves and passing over crossings. The greatest lateral movement is felt at the ends of the body overhanging the trucks. In articulated units there is no overhang. The tendency of ordinary coupled cars to "roll" is often noticeable. This is absolutely impossible where the two ends are pivoted on one truck. Nosing, an annoying feature of double-truck cars in a train, is reduced when the articulated principle is employed. The bodies do not wander from side to side, but follow the true center line of the track. Better interconnection of passengers is made possible by the cylinder-type vestibule used. Better location of electrical control is made possible in the combined units, and wire connections are much simpler.

Although articulated units have many advantages, there is one serious objection to their use on surface

railway operation to a point far beyond pre-war or even war-time figures; so that, even with increased rates of fare, it is no longer possible to operate on the pre-war basis. All street railway companies have been searching for the means whereby they can offset these mounting costs, and we find such changes as one-man car operation, train operation, rerouting, skip stops, light-weight cars, etc., almost universally adopted.

The United Railways & Electric Company of Baltimore met the situation in the usual manner, with the operation of one-man cars on several lines, extensive trailer operation, multiple-unit train operation, etc., and was successful in stemming the first tide of rising costs. However, expenses still continued to mount, and it became imperative to make further economies. One-man operation on a larger scale was the logical solution, and, in the study of the problem, the question, "Why not one-man operation, but in the form of two men to two cars?" kept coming up. Obviously, such a scheme would eliminate many of the drawbacks of the ordinary



Washington, Baltimore & Annapolis Electric Railroad finds articulated units extremely satisfactory for interurban service

lines. Traffic in most cities does not warrant the use of such large units except during rush hours. The articulated units are not so flexible as are the double-truck cars designed for multiple-unit operation. Were it possible to fill all the available space of the cars during a larger portion of the day, the problem would be solved. However, such units have been used in a number of the larger cities and in most cases have proved to be a success.

Articulated surface car operation has been carried farther in Baltimore than in any other American city. The transportation problem there, since the war, has been typical of all our large cities. Wages and material costs have risen, traffic congestion has become increasingly more serious, people have moved farther away from the business center, and the competition of private automobiles has made heavy inroads on off-peak traffic. The elimination of "all day" parking downtown has only served to increase the difficulty, as these people have been thrown back on the street cars in the peak hours, and the parking places left vacant by them have attracted persons traveling in off-peak hours who formerly used the cars, with the result that there is an increasing demand for peak-hour service, with a marked falling off in off-peak traffic.

All of these factors have increased the cost of street

type of one-man car operation, particularly on heavy traffic lines.

The difficulty to be overcome was that of providing a safe passageway for passengers between cars. The articulated center compartment between cars, as had been tried in Boston and Richmond, was discarded, on account of the possibility of opening up when the cars split switches. The idea of mounting the trucks at extreme ends of the cars, to reduce end overhang and allow covered passageways between cars, was found to be impracticable. It was even thought that end doors, interlocked with the control circuit, so as to allow for movement only when the cars were at rest, might be the answer. But in the end the articulated two-car, three-truck combination then being used in Milwaukee and on several steam railroads in Europe was felt to be the best solution.

In September, 1924, the first articulated unit was placed in service. It was constructed from two double-truck, semi-convertible cars, seating 44 passengers each. One platform was removed from each car and the adjoining trucks were taken off, the two bodies then being joined, bulkhead to bulkhead, through a special center truck and cylindrical passageway, which form the point of articulation. The transverse seats were taken out of

the body which formed the leading half of the articulated unit and longitudinal seats were substituted, while the other body was equipped with the maximum number of transverse seats and a "bay window" seat in the rear. New folding doors and steps were constructed at the forward end of the rear body, and the old doors and steps at the rear platform were removed. A conductor's station was provided in the front end of the rear body, immediately behind the passageway leading from the forward body. The seating capacity of the completed car was 87.

The first train was a success from the beginning, and soon proved to be the most popular piece of equipment on the system. Twenty-one similar units were placed in service in 1925, and twelve more in 1926, making a total of 34 now in service.

The best way to describe the method of operating articulated cars is to describe the operation of line No. 15, Baltimore Street-Gay Street line, before and after the introduction of articulated cars. The old time-table

more figures, articulated cars can economically be used to replace any single-car operation of four-minute headway or less. Of course, when five-minute articulated-car service is furnished, in place of four-minute single-car service, the saving is small, but the public has the advantage of a 60 per cent increase in seating capacity. The full advantage of articulated car operation is obtained when they are used on operations requiring 2½-minute headways, or less, with single-car units, assuming that the same seating capacity is furnished in each instance.

Adoption of the articulated type of car by the Washington, Baltimore & Annapolis Electric Railroad was perhaps the most significant application of this type of construction. The articulated design was adopted after a careful study of conditions on this particular property, and the ten units put in operation early this year were constructed to suit its specific requirements. The main-line division from Washington to Baltimore competes with two steam railroads and, therefore, is required to maintain a high-speed, non-stop, comfortable service. At



Intercommunication between cars and lower operating expenses are advantages of articulated units used in subway service by the B.-M.T.

called for 20 cars on the base, and 60 cars on the peaks. Obviously, 40 cars were formerly tied up for peak-hour service only, and these cars were manned by 80 men. Under the articulated car program, these 40 cars were combined into 20 articulated units. The base operation is still carried out by 20 single-car units, but on certain trips in the afternoon, using the evening peak for illustration, the base crews exchange their single cars for articulated cars. This doubles the capacity of the line without adding anything to the labor cost. On the extreme peak, the 20 single cars, previously turned in by the base crews, come out again, manned by 40 men. The saving amounts to 40 men on this line, and the net saving, after allowing for all interest charges, etc., amounts to approximately \$2,300 per year per articulated unit, at the present scale of platform wages, and after allowing for spares.

After nearly three years of experience in the operation of articulated cars, the operating officers of the company are agreed that they furnish the most satisfactory means of handling heavy traffic. Articulated cars are suitable for any kind of service where the traffic is heavy enough to warrant reasonable headways. Assuming that five minutes is felt to be the maximum headway, consistent with good rush-hour service, and using Balti-

the time of the study the main line had experienced a slight falling off in traffic, but since articulated units have been in service the line has been able to hold its own.

Operation of articulated units by the Brooklyn-Manhattan Transit Corporation, Brooklyn, N. Y., is extensive and has proved to be extremely satisfactory. At the present time the company has 75 units of three cars each. All of these are in subway service. The three-car units may be coupled together and run in multiples, making trains of nine or twelve cars as desired.

The city of Detroit built its first articulated unit about three years ago. This consisted of a three-car train with four trucks and was designed as a rush-hour unit to handle the enormous crowds from the automobile factories of the city. Its operation required men who had been specially broken in and when extra men were called upon to operate it in the rush hour, this condition was the cause of some difficulty. The length of the cars made its operation on the congested city streets rather cumbersome. It was found also that on the outskirts it was necessary to make practically all of the stops because there was usually some one to get off at each stop. Therefore, on a close headway this unit had to make every stop, whereas with the single-car operation on the same schedule stops were occasionally skipped.



Modern elevated railway structure in Chicago is a marked improvement over older types

Determining the Relation of Rapid Transit *in a* Transportation Plan

By E. J. McILRAITH

*Staff Engineer
 Chicago Surface Lines*

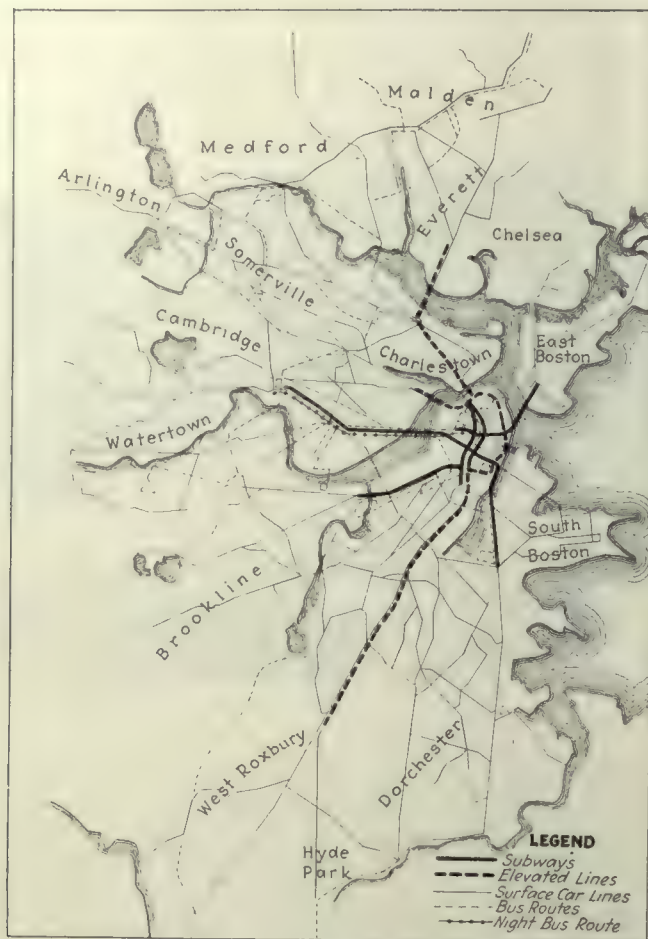
ONCE when the spirit of promotion was running strong and enthusiasm prevailed for building railway lines of all types, it was seriously believed that rapid transit could be financed by private corporations and would yield a profit from operation. The original lines of elevated railway or of subway were classed as sound ventures in transportation for which car riders would pay the cost and a profit on the investment as well. It has been proved, however, that the car rider cannot carry all the burden of cost without an excessive fare. Moreover, on economic grounds the car rider should not pay all the carrying charges of the investment in addition to the cost of operation. Such procedure amounts to special taxation of part of the citizens for the benefit of all and to provide special profits for a few.

Today there is general acceptance of the idea that rapid transit is in reality "special right-of-way" transit that provides an additional street. It benefits (1) the city as a whole more than several new streets or boulevards on the surface would do if they were created; (2) the owners of the property the value of which is enhanced because of its increased accessibility; (3) the automobile owner or others using vehicles which have greater freedom of movement on the street because the majority of persons are carried on the new right-of-way;

(4) the car rider, who moves faster and can have a wider choice of home district or of locations for employment.

Street congestion due to the general use of private automobiles creates a new demand for separation of the various kinds of traffic to avoid excessive interference and permit the greatest possible use of existing streets for transportation in individual automobiles. If trucks, electric cars, and even pedestrians can move on different streets or on different levels from the private automobile, each class of traffic will be much better served. The most effective separation comes from moving the electric car to a new level. One four-track electric railway on specialized right-of-way (in subway, on elevated structure, or on embankment) can serve more people in the rush hour than seven streets used by surface cars, buses and other vehicles, or ten boulevards for buses and private vehicles, or 25 boulevards used by private vehicles alone. The street area vacated by the cars that formerly carried the people on the surface can serve more of the other vehicular traffic.

The present-day value of such new street levels is



Surface car subways are an important element in Boston's rapid transit system

more vividly apparent than it could have been even a few years ago, when the demand for street space was much less intense. It is now clear that the creation of a rapid transit line is the most effective form of street widening project, and can well be undertaken as a civic betterment rather than as a project financed by the car riders' fares.

There is a great need for increased service from city street area. Roadways are much too narrow for the intense use being made of the building area. Buildings of greater size are being erected, and the concentration of citizens in the central district of each city is mounting almost unbelievably. It is not uncommon in the largest cities to find more than 4,000 persons housed during the business day over a single acre of ground area, and the buildings they occupy are visited each day by at least as many others in the transaction of daily business. For obvious reasons the streets cannot be increased in number or in width in such districts. More use must be made of the existing widths by adding new levels for specialized segregated movement; that is, one level for pedestrians only, one, two or three levels for electric trains, and the surface of the street for the vehicles that must operate in open air. These vehicles must further be controlled or segregated for maximum conveniences by requiring service or delivery vehicles handling goods, supplies or waste materials to operate only at night.

Intensive concentration of the administrative, advisory or managerial functions of commercial development is fundamentally sound. Cities always have housed the leaders of business and dominating forces of the world's activities. Business leaders must have convenient contact and speedy access to each other, and the modern tendency to house such commercial functions in large buildings closely related and with convenient access to one another is not dictated by chance, but by sound logic



In the congested section of Fifth Avenue, New York City, buses on a fifteen-second headway carry approximately 9,000 passengers per hour at a speed of about 5 m.p.h.

and real economic necessity. It is vital to commercial effectiveness that the administrative leadership be centralized in strategically placed large cities, and that in those cities there be a concentrated central district for that group that must have convenient personal contacts with one another and with clients or customers from out of town.

Such density of use of central business areas will in reality simplify the problems of providing more effective time-saving conveniences and greater comforts. The cost of housing and land per person employed may be higher than in cities of low buildings such as London, but the greater effectiveness of American business meth-

tribution of service by appropriate routings and combinations. As the city grows some or all of these short sections of special separate underground street will be extended outward and may be built also through outlying business centers. As the density of use grows it will become necessary to develop train service over sections of the system, much as is now being done between stations in Boston. There the surface lines serving each section run to a convenient terminal a short distance outside the busy city center, where the passengers walk across a platform to a train that operates into the center of the city, and across to a similar station on another side of the city. Thus the surface cars do the collecting and



Rapid transit elevated railway is not considered objectionable in this high-class Chicago residential district

ods is forcefully shown in the higher standards of comfort attained by each class of citizens in the cities in this country. Their earning power is greater because of their highly organized performance, and so their share of the world's luxuries is greater.

In Boston the buildings are low under city regulation in an effort to promote a widespread business area, yet it only increases the difficulties of getting convenient accessibility. It means longer walks, more time lost, and more people moving farther horizontally on the streets instead of riding farther vertically by fast elevators. It necessitates more miles of streets and increases the mileage of transit track for the same service rendered.

Cities approaching a million in population can well justify some development of special right-of-way transit. In the central section the earlier construction should provide a nucleus for the complete system, yet it need not be extensive at first to serve the purpose of creating new street space and consequent improvement in convenience for movement of pedestrians, vehicles, and electric cars in the busy area.

It is probably better to start with a system of subways for surface cars, thus removing the cars from all streets in a restricted central district and affording good dis-

deliver the passengers at convenient points to the terminus of a short rapid transit line, which uses track space in the center of the city much more economically than would be done by routing all of the surface cars from the exchange terminal to and through the central district. As the city grows the rapid transit train service should be extended as fast as such operation can be justified.

The rush-hour crush on some of the rapid transit lines of New York and the jam of vehicular traffic on Fifth Avenue cause much mistaken moralizing on the futility or impracticability of having concentrated business areas in large cities. Huge buildings are still being built on Manhattan and are projected by sound business organizations. There is ample reason for such investments, and transportation facilities must follow. The troubles of the citizens are not due to the concentration of Manhattan but to faulty planning, faulty principles in financing, faulty theory in creating separate competing systems and faulty statesmanship in neglecting to correct wrong practices in financing and operation when they were recognized and found to be destructive of the city's best interests. Adequate planning could and would have prevented the present troubles and an expenditure that

is within reason can correct them, but the political and financial difficulties of changing face are so great as to seem nearly insurmountable. Other cities need not experience any such difficulties, and the present mood of the citizens and of officials in most cities indicates that more appropriate planning will be done to keep the transit facilities ahead of the needs of the community.

Take Chicago as an example. There has been general indorsement of the idea of special assessments for partial payment of the cost of rapid transit. The report of the Citizens' Advisory Committee to the sub-committee of the City Council (1926) reads in part as follows:

The lesson to be learned from New York is that the city of Chicago should not build one foot of rapid transit structure, either elevated or subway, without the application of the principle of special assessment, lest Chicago be precluded from this important method of financing for all time to come.

The present city administration, as well as the previous one, has freely stated the necessity of a sound method of financing based on the theory of distributing the cost according to the benefits received.

Plans have been carefully worked out for the physical layout to give a thorough system to the city, based on a comfortable standard of service at all hours. There need never be in Chicago any of the excessive crowding in rapid transit cars that exists in New York. The development can always be far ahead of the needs of the riders, so that the cars and trains may be only appropriately filled in rush hours, not overcrowded. Jammed loading is quite unnecessary and cannot be tolerated.

Sharing the cost of construction and development of a single system comprising all forms of transportation units will permit competent development as fast as needed without undue burden on any one, and will provide good, co-ordinated service at a moderate rate of fare. However, it is absolutely vital that the correct principle be

recognized and applied early in the development of a rapid transit system, so that a few land owners may not make enormous profits from unearned increase in property value at the expense of the car rider, or from all the citizens through their contributions to general taxes, either directly or in rents and increased prices of goods.

A city transportation plan should supplement and assist in logical development of the city by spreading the advantages for the good of all and permitting a normal growth for all sections.

A resolution adopted by the National Association of Building Owners and Managers in June, 1923, includes the following statement:

Transportation is a servant and not a master. Urban transportation should fit the city. The city should not be fitted to the transportation.

Unfortunately, we have had examples of many miles of expensive rapid transit structures being built through open fields, as in greater New York, at times when the money should have been spent to relieve the highly undesirable crowding in the central business section of the city where the trunk lines are inadequate. The lines built were not planned to fit the city needs, and did not develop in the city's busy section to keep in advance of the needs for service.

Transportation lines should be built neither to exploit real estate nor to control a city plan. The growth and development of transportation should supplement and support the natural tendency of city growth. The expansion of a city street system by the use of subways or other special rights-of-way should be planned toward a comprehensive ideal system, permitting the ultimate economic development of the city, and serving through the various stages of its growth to give all parts of the city reasonable advantage in using, enjoying and profiting from the investments and developments.



Lower end of Manhattan Island, where concentration of business activities in tall buildings exceeds that found anywhere else in the world

Single-Truck Cars

Best Meet the Needs in Smaller Communities

By HORATIO BIGELOW

*Superintendent of Railway
South Carolina Power Company*



*More frequent service is given in Charleston, S. C., by Birney cars
than would be possible with double-truck cars*

SINGLE-TRUCK cars still have an important part to play as public transportation vehicles in cities under 100,000 population. Systems operating them, however, are faced with a real problem in putting them on a sound operating basis. Experience not only in Charleston, but in many other cities of comparable size, indicates that the salvation of these properties depends on holding operating costs to a minimum.

The automobile has made its greatest inroads on railway operating revenues in cities of this size. The parking problem is not so important in these cities as it has become in larger centers, and does not limit the use of the private vehicle for ordinary travel. When the geographical layout of a city between 50,000 and 100,000 population is such that homes and places of business are comparatively close together, those who do not own automobiles always have the option of walking, and do so on comparatively slight encouragement. Under this

combination of circumstances the single-truck car, which permits frequency of service to be given at minimum cost, often is the best vehicle to meet the transportation needs of the community.

There is only one serious objection to the use of such cars. That is the poor riding quality on rough track. The length of the rigid wheelbase on a single-truck car necessarily is limited to negotiate the short curves encountered on the average city property. With such cars it is particularly important that track be in first-class condition, or the ride will be so uncomfortable and unattractive as to discourage patronage. It is probably due to this limitation of the single-truck design that many small properties have been led to the adoption of cars much too big and heavy for the density of their traffic, resulting in a serious increase in operating cost as well as long headways. Because of this, costs have been increased to the breaking point on many properties, and



In Jamestown, N. Y., operation of de luxe single-truck cars has increased revenue 7 per cent in eight months

there has been a decrease in number of passengers due to the long waits between cars.

An example of what can be done to solve the problem of reducing operating costs is afforded in the experience of the railway system of the South Carolina Power Company at Charleston. In this city of 70,000 population there is no mass movement or peak load of importance on its urban lines. Distances are short. The city is level. The streets are well paved. Three years ago there were five types of cars in regular service on the system. These were: (1) Birney cars; (2) semi-convertible, wooden, single-truck cars rebuilt for one-man operation; (3) one-man, double-truck (maximum traction) steel cars; (4) wooden two-man, double-truck cars, and (5) steel, center-entrance, two-man cars with multiple-unit control. With this equipment the average energy consumption was 2.18 kw.-hr. per car-mile and the average maintenance cost 2.65 cents per car-mile. For the year 1923 the system showed a ratio of operating cost, including taxes, to gross revenue of 107 per cent, with a consequent loss of many thousand dollars. The edict then went out that the railway department had to be self-supporting if it were to continue operation.

Accordingly, the railway commenced a thorough rehabilitation program. All city operations were placed on a one-man basis. This necessitated the changing over of many of the old cars. During the three ensuing years,

although the gross receipts fell off \$150,000, there was a decrease in operating expenses of \$220,000 and an improvement of 15 per cent in the operating ratio.

The cars converted were seventeen years old on the average, weighed 14 tons each and were equipped with two 40-hp. motors. By 1927 more than half of them had been placed in storage because of the need for extensive repairs. The railway was thus faced with the necessity of adding to its equipment. As the city was just starting a four-year repaving program, with which the company's track rehabilitation had to be co-ordinated, it was deemed inadvisable to purchase new cars at that time. Accordingly, used single-truck, improved Birney-type safety cars, averaging five years old but in good operating condition, were purchased for the same cost as the repairs necessary on the converted cars. These cars weigh 8½ tons each and are equipped with two 25-hp. motors. It was estimated that they would save ¾ kw.-hr. per car-mile in energy and ½ cent per car-mile in maintenance over the converted cars. Actually, they are saving ¾ kw.-hr. per car-mile in energy consumption instead of ¾ kw.-hr. per car-mile as estimated, and it is believed maintenance figures when obtained will bear the same relation to the estimated figure. The total annual saving per car from this substitution, considering only energy and equipment costs and neglecting maintenance of track and roadway, should amount to \$600. Substantial increase in the proportion of single-truck cars on the property has made it possible to produce operating economies that have prevented further cutting of schedules to meet depleted revenues.

Similar results have been obtained elsewhere. In Knoxville, Tenn., the single-truck car is an important agency in meeting the transportation needs. Features of additional comfort and attractiveness have been incorporated in the design of these cars. On June 1, 1924, the company replaced four old-type, heavy, two-man, single-truck cars with six modern, one-man, single-truck, safety cars on a line which serves the best residential section of Knoxville. This is a route that requires practically the same headway throughout the day. Service was increased 33½ per cent, from a fifteen-minute headway to a ten-minute headway, and revenues increased proportionately.

This substitution resulted in reducing expenses for energy, maintenance of equipment and maintenance of way from 9.1 cents per car-mile to 5.6 cents, a saving of 3.5 cents.



Single-truck cars of the Miami Beach Railway have large platforms with double doors to facilitate passenger movement

In Zanesville, Ohio, twenty new single-truck, one-man safety cars were put in operation in 1925, in connection with the reorganization of the local railway system, which had emerged from a receivership the year before. Savings made possible by this move helped to reduce operating expenses more than \$48,000. Despite a loss in gross revenue of 10.4 per cent, net revenue for the year increased \$24,000. Power expense has been decreased \$14,000, or from 4.71 kw.-hr. per car-mile at the switchboard to 3 kw.-hr. A comparison of maintenance of equipment costs for 1924 and 1925, the year before the

aisle so that passengers can pass backward and forward from their seats in the rear of the car without brushing against seated passengers. Platforms are larger with both exit and entrance doors, and there is a rear exit, controlled by the motorman, for the use of colored passengers. A drop platform makes access to the car easy. This platform is 5 in. below the car body, the first step from the street is 12 in. above the rail, and the second step is 11 in. below the platform.

In Mobile these single-truck, safety cars are operated on the streets where the automobile traffic is the heaviest,



Better speed is maintained in Mobile, Ala., with single-truck, one-man cars of this type than with two-man cars on account of quicker acceleration and stopping

new cars were installed and the year after, shows a saving of \$11,572 in this account or 58.6 per cent.

Despite arguments in favor of double-truck rather than single-truck cars, it was thought better to provide shorter headways with single-truck cars rather than longer headways and larger cars. Like the Knoxville cars, those units can be operated either front entrance and exit or front entrance, rear exit. The rear door is controlled by a separate valve from the motorman's position. Two rear vision mirrors are used, one inside and one outside the vestibule. An auxiliary red lamp on the rear dash is arranged to light when any of the doors are open and warn approaching motorists that the car is taking on or discharging passengers. Seats and backs are of spring construction and are covered with taupe plush of a design harmonizing with the interior finish. The single step between the street and the platform is recessed, the folding doors protecting the step when in the closed position.

The Mobile Light & Railroad Company, Mobile, Ala., ordered some single-truck, Birney, one-man cars during the war period. On a subsequent order for cars to be delivered this year, a more strongly built unit weighing 10 tons was specified. In this design there is a wider

while the majority of the two-man cars are operated for the greater part of their routes on tracks within parkways or on private right-of-way. Despite this the number of accidents per car-mile is 13 per cent greater on two-man cars than on one-man cars. On the one-man car lines more frequent service is given than formerly when two-man cars were used, while track maintenance is less than on the two-man routes. Moreover, schedules are more easily maintained on the one-man routes on account of the quicker acceleration and stopping.

Certain unusual features have been incorporated in the design of the latest single-truck, one-man, safety cars of the Miami Beach Railway. The warm, humid climate of Florida has a harmful effect on the materials used in car construction. In order to prevent rapid oxidation of the metal, these cars utilize copper-bearing steel plates extensively. All wood has been treated with preservatives in order to guard against destruction by insects and to give long life. All cars are double-end with wide double-stream doorways. In contrast to the new cars at Knoxville and Zanesville, the cross seats are of wood slat construction.

De luxe single-truck cars were recently purchased by the Jamestown Street Railway, Jamestown, N. Y., for

city operation. These cars are designed with convex sides, round ends, and arch roofs. The exterior painting scheme has a pyramid gray body color, blue belt rail, desert sand letterboard, and cream sash, all blocked off by a horizontal black stripe. The car roof is gray and the trucks black. Interiors are finished in mahogany with white veneer headlining and gray trim. Broad seats with deep spring cushions and padded backs are covered with genuine Spanish leather. Thirty passengers can be seated comfortably. Ample knee room is provided by the spacing of the seats at 31-in. centers. Floors are covered with inlaid rubber tiling colored to blend with the interior finish. This tiling serves to deaden truck noises. Peerless ventilators installed on the roof are fitted with grille and register. Cars are heated with individual double-coil, truss plank heaters, and the temperature is regulated by thermostatic control. The one cab heater is supplied with a separate control. An unusual number of safety devices have been incorporated in the design, including even an emergency exit door on the left side at the extreme rear. Large, folding, selectively-controlled, air-operated doors permit easy entrance and exit. When the door is open a stop sign attached to the exit door acts as a warning to approaching vehicles that passengers are alighting. The cars are provided with brilliant interior illumination: three two-lamp dome fixtures on the ceiling and two door lights, besides the usual farebox, sign, tail and head lights. A stop light on the rear shows red when air brakes are applied. Resistance grids with suitable covering, permitting proper ventilation and preventing entrance of rain and snow, are installed on the roof instead of beneath the car floor. All platform control apparatus is inclosed in mahogany cabinets, creating a ship-shape platform appearance. Large section, plate-glass windows in the vestibule insure an unobstructed view at all times. Seven large windows

on the right side of the car and nine on the left side, with cross-bar window guards, provide clear vision without danger of injury from passing cars.

There is no doubt that passengers should be made as comfortable as possible on street cars so that they will "come again." On suburban and interurban lines and on the longer city routes, where double-truck cars are operated, spring seats and backs neatly upholstered attract patronage and increase revenue. Floor covering to deaden truck and equipment noises and adding to the finish of the car also pays. With single-truck, safety cars operated on the short routes it is a question whether or not it will pay to equip them with upholstered seats and floor covering? It costs approximately \$600 per car to do this. On three of the railways mentioned above, i.e., Knoxville, Zanesville and Jamestown, the single-truck safety cars are provided with such seats and on two of the properties, Zanesville and Jamestown, with floor covering. Decreased industrial activities in Zanesville have made it difficult to determine the gain in revenue produced by the installation. In Jamestown, N. Y., the de luxe, single-truck cars with the equipment in question have increased revenues 7 per cent in eight months. Despite such showings not all railway managers feel that the expenditures for these features are justified.

The primary question in determining the field of the single-truck car is whether there is any pronounced mass movement during the day? If there is, the single-truck car is like "Dobbin" in the early days, it can't pull the load. The single-truck, one-man, safety car still holds its own on the smaller systems where there is no mass movement and on the light traffic lines of the larger systems. Given good track, the light-weight, one-man, single-truck, safety car furnishes the most economical type of transportation known.



Rear exit is provided on single-truck cars operated in Knoxville, Tenn.



Light interurban cars have played an important rôle in the rehabilitation of the Chicago & Joliet Electric Railway

Radical Changes Save the **Light Interurban**

By J. R. BLACKHALL

*Vice-President Chicago & Joliet Electric Railway
Joliet, Ill.*

SOME ONE has defined competition as "the keynote of success," and certainly it is true that competition has been responsible for many radical changes in American industry. In the early days there was the destructive competition of rates and prices. Gradually, however, this has passed so that present-day competition more generally concerns service and quality, rather than rates and prices. In the transportation field competition has been responsible for many changes in operating practices.

On the whole competition has been felt more keenly on interurban lines than on city lines. This has made it imperative to develop some remedy. Following experience with lighter weight cars in city operation, and the encouraging results obtained with their use, it appeared logical to adopt lighter interurban equipment with some changes of design. This would require less capital investment, make it possible to reduce labor costs, allow faster schedules with the ever-increasing number of stops, and attract additional passengers. About the time of the introduction of the Birney car, several companies began experimental operation of light-weight, double-

truck cars that not only rode easier and were more attractive to the public than the cars then in common use, but also promised large reductions in operating costs. When the trial operation of the new type equipment demonstrated greater operating efficiency and increased traffic by virtue of better and more regular operating schedules, many other companies were led to the adoption of such equipment.

Among the roads that first demonstrated the feasibility of the light-weight car for interurban service was the Kentucky Traction & Terminal Company. This company was in a situation about as difficult as it could be, with traffic decreasing rapidly as a result of jitney and other competition and high operating and maintenance costs. The story of the rehabilitation of that property to a dividend-paying condition is history now and need not be repeated here. Introduction of the light-weight car by this company was its salvation.

The Chicago & Joliet Electric Railway, operating an interurban line between Joliet and Chicago, although never having had really heavy cars, nevertheless found itself in a difficult position when operating costs in-

Energy Savings with New Light-Weight Interurban Cars

Month	Kilowatt-Hours per Car-Mile New Cars 1926-7	Old Cars 1925-6	Difference	Per Cent	Total Miles 1926-7	Total Estimated Kilowatt-Hour Saving
Sept. 8-30..	2.38	2.68	0.30	11.2	39,448	11,820
October....	2.29	2.98	0.69	23.2	45,355	31,220
November..	2.26	2.90	0.64	22.1	42,991	27,500
December..	2.24	2.97	0.73	24.5	44,190	32,200
January....	2.42	2.62	0.20	7.6	42,943	8,600
February..	2.14	2.81	0.67	23.8	36,770	24,600
March.....	2.15	2.74	0.59	21.6	40,960	24,100
April.....	2.16	2.80	0.64	22.8	43,871	28,100
May.....	2.05	2.66	0.61	22.9	50,638	30,800
June.....	2.10	2.70	0.60	22.2	48,762	29,200
July.....	1.96	2.53	0.57	22.6	56,489	32,200
	2.196	2.762	0.566	20.5	492,417	280,340

Total saving in energy cost of 280,340 kilowatt-hours at \$0.0186 = \$5.214 36

Comparative Earnings, Platform Expense, and Energy Costs

	1926-7	1925-6	Saving or Difference	Per Cent
Gross earnings	\$331,677.55	\$312,711.44	\$16,966.11	6.06
Average kilowatt-hours per car-mile	2.196	2.762	0.566	20.50
Platform expenses per car-mile, cents	4.40	6.86	2.46	35.90
Summary of Increased Earnings and Savings				
Total miles operated by new cars				492.417
Total kilowatt-hours saving on new cars				280.340
Total increase of gross earnings				\$18,966.11
Total savings platform expense				12,113.45
Total savings power costs				5,214.36
Total earnings and savings				\$36,293.92

creased. After a careful study of the results obtained by other companies that had adopted light-weight cars and the results of its own operation of light-weight cars in city service, the company concluded to replace its equipment on the interurban line with modern, light-weight cars. Ten cars were purchased, constructed to design and specifications furnished by this company, including several new features. They were delivered and placed in service in September, 1926. Six of them are of the single-end, one-man type for through interurban service, the four other cars are of the double-end, one-man type for local interurban service.

The new cars weigh 39,000 lb. each, compared with an approximate weight of 62,000 lb. for the old type cars. They are equipped with four 35-hp. motors as compared with four 100-hp. motors on the heavier cars. With the old heavy type equipment adherence to the schedules was fast becoming an impossibility. To determine the motor capacity for the new cars, a thorough analysis of service requirements was made by the company's engineering department in collaboration with the manufacturer. The lighter weight cars have been able to maintain schedules in the face of a continual increase in number of stops per mile.

As the outward appearance of the car makes the first appeal to prospective passengers, considerable thought was given to securing a pleasing, streamline effect and painting the cars in an attractive color combination. The general interior appearance has been improved by concealing all air piping, switches, meters, etc., in mahogany finished cabinets. All side windows are fitted with wip-

dow guards of the disappearing type that rise with the sash, affording better visibility for passengers and adding to the attractiveness of the car. Interior lighting is of the semi-indirect type, a soft illumination being furnished from overhead dome fixtures that eliminate all glare. Car seats are of semi-individual type, comfortably upholstered in leather and plush. The characteristics noted above are relatively new for cars of this type and have a distinct appeal to the public. The ramp of the floor from the vestibule entrance permits a low step height and eliminates the necessity of any additional step from the vestibule to the car. Contrary to usual practice, sliding doors were provided, adding to the general clean-cut appearance of the car. This has reduced noise and maintenance. Floors are covered with battleship linoleum.

Prior to the purchase of the cars, it was estimated that by their adoption an annual reduction in operating expenses of approximately \$30,000 would be made and also an increase of \$10,000 effected in revenue, or a total increase in net revenue of \$40,000 with a capital investment in the new equipment of \$168,000. While an increase in wages of operators that went into force on Jan. 1, 1927, materially effected the estimated saving, the reduction in operating expenses, not including any reduction that can be attributed to maintenance of track and roadway and equipment, amounts to \$17,327. Gross earnings for eleven months show an increase of \$18,966. On this basis, the increased net will about equal the estimate for the year. No definite figures can be given of savings in maintenance of track and roadway and equipment, but it is reasonable to assume that there will be a saving in

Comparative Gross Earnings of Interurban and City Lines Before and After Ten New Interurban Cars Were Put in Operation

Month	Interurban Lines				City Lines			
	1926-7	1925-6	Difference	Per Cent	1926-7	1925-6	Difference	Per Cent
September 8-30.....	\$22,348.78	\$21,090.21	+ 1,258.57	+ 5.95	\$23,754.75	\$23,128.21	+ 626.54	+ 2.70
October.....	30,347.00	27,786.08	+ 2,560.92	+ 9.22	23,516.11	23,813.66	- 297.55	- 0.88
November.....	27,696.05	25,766.82	+ 1,929.23	+ 7.4	35,589.41	34,585.02	+ 1,004.39	+ 2.9
December.....	27,977.77	26,381.04	+ 1,596.73	+ 6.0	40,780.75	40,591.71	+ 189.04	+ 0.4
January.....	26,194.27	25,743.27	+ 451.00	+ 1.65	38,407.02	38,615.81	- 208.79	- 0.54
February.....	24,113.58	23,131.52	+ 982.06	+ 4.25	32,510.66	33,497.02	- 986.36	- 2.95
March.....	25,965.60	23,822.64	+ 2,142.96	+ 8.85	33,983.45	36,195.43	- 2,211.98	- 6.10
April.....	28,202.04	26,079.40	+ 2,122.64	+ 8.15	32,291.40	34,621.20	- 2,329.80	- 6.72
May.....	37,010.90	36,286.92	+ 723.98	+ 2.00	31,527.45	32,776.83	- 1,249.38	- 3.81
June.....	34,205.62	33,808.85	+ 396.77	+ 1.17	30,612.66	30,455.96	+ 156.70	+ 0.51
July.....	47,615.94	42,814.69	+ 4,801.25	+ 11.2	30,779.17	29,944.12	+ 835.05	+ 2.79
Total.....	\$331,677.55	\$312,711.44	+ 18,966.11	+ 6.05	\$363,752.83	\$368,224.97	- 4,472.14	- 1.22

each of at least 1 cent per mile. On that basis there would be an additional saving of more than \$10,000 by the adoption of the lighter weight equipment, or a total increase in net of \$50,000. That is a return of 30 per cent on the money invested in this new equipment.

The increase in gross earnings amounts to an average of 6.06 per cent, whereas the earnings had previously remained practically stationary and in decided contrast to a decrease of \$44,072, or an average of 1.22 per cent during the same period on the Joliet city lines operated by the same company. The increase in revenue can be attributed to prompt appreciation by the car riding public of greater riding comfort of the new cars and the better maintenance of schedules with a slightly higher average speed, this being the result of more rapid acceleration and braking of the lighter type equipment.

An average energy saving of 20.5 per cent has resulted from the weight reduction of the new cars. The old type car consumed an average of 2.76 kw.-hr. per car-mile against a consumption of 2.20 kw.-hr. per car-mile for the new equipment. One-man operation has effected a saving in platform expense of 2.46 cents per car-mile

existing operating conditions. During the period between which the photographs were taken the original angle bar joints have been replaced with Weber joints, ties have been renewed as required and additional ballast added where necessary.

One-man operation is an important feature of the light-weight car from more than one angle. In addition to the large reduction in platform expense, such operation affords greater safety to the public, for with one-man operation there are actually fewer passenger accidents because responsibility and control of the car are centered in a single individual instead of being divided, as is the case on the two-man cars. As an additional factor of greater safety in transportation, many companies are now adopting safety car appliances on interurban equipment similar to those on city type cars.

The experience of some eight to ten years operation of light-weight, double-truck electric cars throughout various parts of the country under many different conditions clearly indicates that this type of car will stand up as well as if not even better than the old, heavier type of cars. At the same time the great riding comfort and



At left—Track of the Chicago & Joliet Electric Railway as it appears today, after being thoroughly reconditioned. Note the adjacent concrete highway. At right—The same track as it appeared twenty years ago, when the highway was unpaved

during the eleven-month period, or an equivalent of 35.9 per cent. While as yet there are no definite figures available on savings in maintenance of equipment and roadway, from the experience of other railway properties light-weight equipment should result in a reduction in track maintenance costs of approximately 30 per cent and a like amount in equipment maintenance. The experience of other companies that have adopted light-weight, double-truck cars during the past eight or ten years has been generally similar to that of the Chicago & Joliet Electric Railway.

It must be admitted that the riding qualities of light-weight cars on poorly maintained tracks are apt to be poorer than those obtained with heavier cars, making it imperative that tracks and roadway be maintained in better condition than has been the practice of many companies heretofore. However, once the track is placed in good condition, maintenance is considerably less than for a track over which cars weighing from 60,000 to 105,000 lb. are operated. Illustrative of adequate track maintenance, two views of a section along the interurban line of the Chicago & Joliet Electric Railway are presented. One photograph was taken more than 25 years ago when the road was first constructed, and the other in August of the present year. The original 70-lb. T-rail is still in service, and judging from its present condition it has an additional life of at least twenty years under

higher speed average afforded have resulted in increased passenger traffic, while the savings in maintenance and power costs have more than justified the expenditure of capital invested in such equipment. The results obtained by companies that have adopted the modern type, light-weight car challenge the attention of even the casual observer and warrant the most serious consideration for still greater improvement in the field of car design.

At the present time this company is building an all-aluminum car body for city service that will be mounted on trucks that are a distinct departure from the standard trucks now in common use. The car complete, with electrical equipment and motors, will weigh approximately 22,000 lb. with a seating capacity of 50. It is entirely feasible that a car embodying the same principles, with some modifications of design and capacities, can be developed for higher speed interurban service, effecting even greater economies than are being obtained by the operation of the interurban car that has been described herein.

Above all, the future success of the interurban railways depends entirely in having the good will of the public they serve in order to secure its patronage and co-operation. To obtain and hold that good will it is necessary to deal honestly with it and render the very best possible service. The modern light-weight interurban car offers one medium of securing that good will.



*Modern all-steel heavy interurban
train on Chicago, South Shore &
South Bend Railroad*

Heavy Interurban

Meets the Urge of Automobile Competition

By C. H. JONES

*General Manager
Chicago, South Shore & South Bend Railroad*

RADICAL changes have come over the transportation business during the past decade and what was once considered almost a monopoly is now a highly competitive industry. This has been brought about by the vast strides made in the manufacture of automobiles and the building of many fine highways, which have made it possible for every automobile owner to compete with organized transportation companies. The effect of this competition, however, has not been entirely detrimental to the railways as it has created in the minds of people the desire to travel and has thereby made potential patrons for them, thus broadening the field from which business can be drawn.

The natural field for heavy interurban operation lies adjacent to the centers of population, where the potential possibilities are large. Such territory is generally well supplied with good highways, making the competition keen. The novelty of driving an automobile is wearing off for many people, however, while the desire for traveling is still with them. With service that satisfies them and plenty of hard sales effort and advertising it is possible to wean them away from the highway to the rails, especially with the aid of congestion, which is becoming worse daily.

In a number of instances, railways which operated under such conditions have been lifted out of the hole

and converted from run-down interurbans to high-class electrified railroads, getting their share of the traffic in their territory and creating business that had never existed before. It is along these lines that the greatest possibilities lie for making the electric interurbans again a predominating factor in the transportation field.

A recent example of this is the South Shore Line, running from Chicago, Ill., to South Bend, Ind., a distance of 90 miles. This line was built in 1908 and 1909. For a few years it seemed to have a rosy future. But due to competition and the fact that it did not keep up with the transportation requirements of the territory, it gradually declined in popularity. It was just about ready for the scrap heap when it was modernized, and within the short period of a year has become a popular transportation agency, clearly demonstrating that the public appreciates good service and will give its patronage when such service is furnished.

To meet the demand for better transportation many physical changes on the line were required. One of the most important of these provides a first-class entrance into Chicago, delivering people into the heart of the city. This was done by arranging for operation over the tracks of the Illinois Central Railroad. This one thing probably had more to do with building up the business than any other single step which was taken.

Car equipment comes under the closest scrutiny of the traveling public. In the case of the South Shore Line this question presented a problem of considerable magnitude and received most careful consideration, since the old equipment was worn out and had to be replaced. Our standards have been raised and are now based on the luxurious finish and comfort of the modern sedan automobile. Increase in business has required the purchase of a second group of cars, and on these an effort was made to add improvements over the first lot. While these improvements have been minor in character they have brought forth much favorable comment from patrons, showing that they are recognized and appreciated.

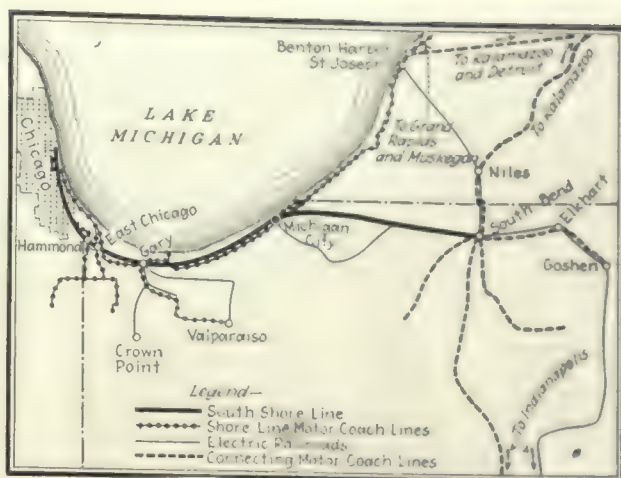
The pleasure of a journey depends to a large extent on the smoothness of operation, and this can only be had over a roadbed which is well maintained. To this end a great deal of work has been done on track that was originally laid with 70-lb. rail. New joints have been installed on the old rail until such time as it is financially possible entirely to replace all rail with 100-lb. section, for which a very definite program has been laid out and is being followed.

Station facilities deserve careful consideration, as in many cases they are the patron's first point of contact with the railroad and create either favorable or unfavorable impressions, depending on whether his necessities are provided for in the way of waiting quarters. We have found that well equipped and operated concessions serving light lunches, beverages, cigars, cigarettes, candy, etc., go a long way toward making interurban stations attractive and satisfying the passengers' wants.

With all these facilities must go good service, because that is what a railroad has to sell, and all of the things mentioned before are only the tools used in providing the service. Frequent and fast service, together with maximum reliability, is what influences most the traveler's choice. In many instances it is necessary to put on increased service considerably in advance of the business justifying it, because with the schedule in effect the road has something on which can be based effective advertising and sales work. The speed of operation should be just as high as possible with safety and absolute certainty that the schedule can be maintained nearly all the time.

A considerable part of the South Shore Line is single track. Hourly service is operated over the entire line daily with half-hourly service over 25 miles of single track on Saturday, Sunday and holidays. This requires well laid out passing tracks at meeting points. A journey that is continuous is a great deal more pleasant than one on which it is necessary to back in or out of sidings. This has been overcome on the South Shore Line by making the sidings long and double ending them, using special trackwork that will allow operation through them at high speed. This arrangement has worked out well and many of our patrons believe that we have considerably more double track than we actually have, as there is practically no stopping at meeting points. Operation has been materially aided by making the maximum use of signaling.

Heavy electric railway service resembles closely that of the trunk line railroads, and the traveler who uses it expects practically the same conveniences that the latter offers. We believe that the operation of dining and parlor cars is a necessity, if the commercial traveler is to be catered to, as he is accustomed to it and uses it to



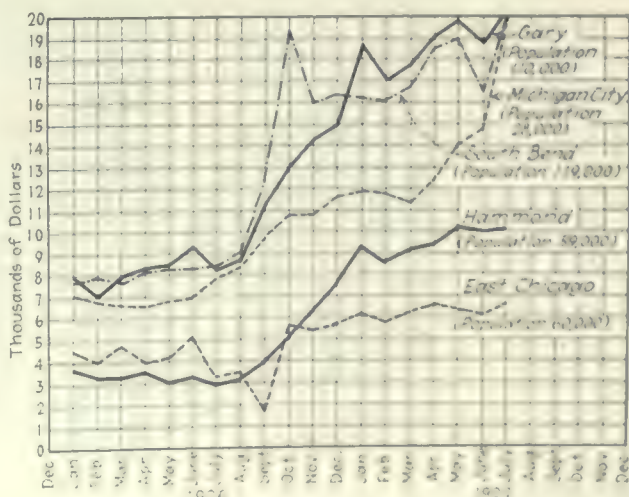
Chicago, South Shore & South Bend railroad and bus routes

conserve his time. This type of service, to be attractive and really get the best results, requires that everything in the way of service, food and prices must be exceptionally good.

With all of the above facilities provided the problem is then one of selling the service to those who want to travel for business or pleasure, and to create business where it did not exist by selling the territory served to those living outside of it.

The selling of transportation service is a comparatively new art and on its success largely depends the prosperity of the railroad. Enlisted in this sales organization must be every employee of the railroad. Each has a definite part to play. Those in the train and station service, who come in direct contact with the public, have it in their power to make the patron's journey a pleasant one and induce him to use the service again and to advertise it to his friends, thus making him a booster for you; or they can create an unfavorable impression and make him a knocker.

The South Shore Line and its affiliated companies in the metropolitan district of Chicago have felt for some time that their best chance for success and maximum service to the public lies in the way of creating business by popularizing the territory served, and to that end a new department of the railroad was created, which is known as the Outing and Recreation Bureau. This



Revenue has increased greatly since new equipment was put in service



Dining and parlor car equipment are needed by the heavy electric interurban that desires to attract high-class patronage

bureau has gathered together all the available facts about the territory, put them together in form that is readily accessible and easily referred to, and has opened up an office and invited the public to ask questions with reference to the territory, what it has of interest, how it can be reached and how much it costs. The response of the public to this new feature of the railroad service has far exceeded all expectations. We are positive that our efforts along these lines have already produced a great deal of new business and feel that the future possibilities are almost without limit.

With the building of good roads and development of

the automotive industry, a new competitor has sprung up in the motor coach. In a great many localities the coaches have made very serious inroads into the business of the electric railways.

Meeting this competition has been a difficult matter and in general was effected by entering the motor coach field ourselves, paralleling the rail line and in some instances serving towns off the line. We are gradually altering the coach lines and concentrating our efforts in their operation to creating a co-ordinated rail and motor coach service that will be of real value to the communities.



Centrally located terminals are essential for successful interurban operation. Cars of the South Shore line now operate into the heart of Chicago over tracks of the Illinois Central Railroad

Electrification of Railroads

Makes for High-Grade Suburban Service

By H. F. BROWN

*Chairman Committee on Heavy Electric Traction, American Electric Railway Association
Assistant Electrical Engineer New York, New Haven & Hartford Railroad*



*Multiple-unit train on the electrified section of the
New York, New Haven & Hartford Railroad*

STEAM railroads serving the larger metropolitan districts of this country have from their earliest beginnings been among the leaders in foreseeing and solving the problems of community transportation. Even before the rapid transit lines in Chicago, Boston and New York were electrified during the period from 1900 to 1905 some of the steam railroads had turned their attention to the use of electricity for a motive power.

Certain difficulties are inherent to all suburban service on steam railroads. This class of service is tremendously exacting. Schedules must be maintained even more rigidly than for long-haul business. The casual traveler, or one traveling from a long distance, is not so prone to be critical of delays as are those who commute daily, even though the delay is slight. Further, when train movements are at their peak during the rush hour in a congested terminal, with but short headway, a delay of even a few minutes is of far more serious consequence to all other terminal movements than in the case of a delay to the through train. Electrification, by increasing reliability, has greatly reduced delays of this nature.

Notable among the earliest installations were the electrification in June, 1895, of the Nantasket branch of the New York, New Haven & Hartford Railroad for passenger service and the Baltimore tunnel of the Baltimore & Ohio Railroad for freight and passenger service, in the same year. While neither of these installations was for suburban service in the strict sense of that term, their success proved the adaptability of electric operation for heavy traction and paved the way for further installations.

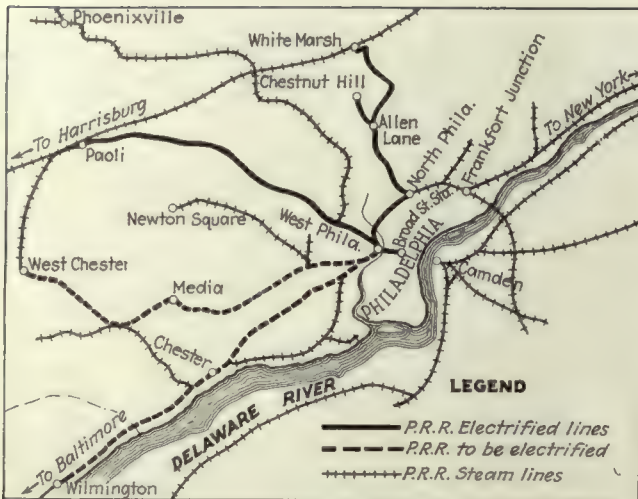
By 1898 electric passenger service had been installed between Hartford and Bristol, Conn., and between Stamford and New Canaan, Conn., on the New Haven system, and also, in 1900, on the same system connecting Providence, Bristol, R. I., and Fall River, Mass. All of these installations were at 600 volts d.c. and were suburban as well as interurban in character. The Hartford-Bristol electric service was later abandoned for various reasons, but the electric service connecting Fall River, Bristol and Providence is still in successful operation, and the Stamford-New Canaan branch has been since re-equipped for 11,000-volt a.c. electric operation.

Summary of Suburban Electrifications

Railroad and City	System Electric Traction	Date	Type of Equipment
Long Island, New York	650 volts d.c.	1904	Multi-unit cars
New York Central, New York	650 volts d.c.	1906	Multi-unit cars and elec. locomotives
New York, New Haven & Hartford, New York	11,000 volts a.c.*	1907	Multi-unit cars and elec. locomotives
Southern Pacific, Oakland	1,200 volts d.c.	1911	Multi-unit cars
New York, Westchester & Boston, New York	11,000 volts a.c.	1912	Multi-unit cars
Pennsylvania, Philadelphia	11,000 volts a.c.	1915	Multi-unit cars
Baltimore & Ohio (Staten Island) New York	650 volts d.c.	1925	Multi-unit cars
Illinois Central, Chicago	1,500 volts d.c.	1926	Multi-unit cars

*Operates also over 12 miles route 650 volts d.c. joint with New York Central

Development of the multiple-unit control system at about this time gave a great impetus to the application of electric traction to train service. In operating several cars, each equipped with motors, from one point of control, it was obvious that higher acceleration rates and



Philadelphia electrified zone of Pennsylvania Railroad

consequently higher speeds between stations short distances apart could be obtained than with locomotive-hauled trains. Terminal switching also could be greatly simplified. Electrification of the elevated and subway lines in the larger cities quickly followed this development, coincident with the installation of electric motive power on three of the steam railroads entering New York, carrying a very heavy suburban traffic. The Long Island Railroad, in 1904, was the pioneer steam road to electrify its suburban service, followed in 1906 by the New York Central and the New Haven in 1907.

Since these earlier installations other railroads have adopted electrification for the solution of their own suburban service problems, until at the present time the list includes no less than eight railroads operating this type of service electrically.

Two outstanding facts are apparent in the tabulation on the preceding page, as follows:

1. Multiple-unit cars are the most popular type of equipment for this class of service.
2. Every system of electric traction, with one exception, now in use in the United States is being success-

fully used for suburban service at the present time, the one exception being the 3,000-volt direct-current system. This does not mean that this system is not suitable for this service, but it is a fact that multiple-unit equipment of this type has not yet been produced commercially.

The reasons why these railroads have electrified afford perhaps the best explanation of the conditions under which it is possible and desirable to furnish electrified suburban service and explain also in a measure the reasons for adopting the type of system used. Tunnel operation was a large factor in all the earlier installations, and legislative enactments in addition gave some of the roads no other choice, making electrification of the suburban service incidental to electric operation of the terminal, including terminal movements of through trains.

LONG ISLAND RAILROAD HANDLES HEAVIEST TRAFFIC

The original Long Island Railroad electrification was made in connection with the depression of its tracks serving the Atlantic Avenue terminal and the substitution of tunnel operation for surface operation with the attendant grade crossings throughout the Borough of Brooklyn. Later, coincident with the construction of the Pennsylvania Terminal in Manhattan, the tunnel entrances to this terminal precluded the use of steam, and the electric service was extended to include this terminal and the additional suburban routes served from it. Further recent expansion to include all the branch lines carrying passenger service in Greater New York has placed the Long Island in the very front rank of electrified steam roads. No other railroad in this country, steam or electric, handles so many commuters daily as does the Long Island, which has more than 100,000 commuters riding daily each way. More than 60 per cent of its entire passenger traffic is of this nature, and during the rush hour, for which equipment and all facilities must be provided, nearly 100 per cent of the traffic is of this character. The total daily movement consists of more than 870 trains, many of which are of the maximum length of eleven cars. In the summer months these trains carry more than 300,000 passengers per day.

Trains on this system are made up of motor cars and trailers, up to eleven cars per train.

Motor cars weigh approximately 58 tons and are equipped with two 225-hp. motors and compose at least 70 per cent of the train make-up. All cars are of steel, of standard vestibule design, and the latest types of a seating capacity for 80 passengers each. With the receipt of those now under construction this road will have approximately 1,000 passenger cars equipped for electric operation. Electric energy required for this service is supplied from the Long Island City power station of the Pennsylvania system.

The New York Central and the New Haven, as joint occupants of the Grand Central Terminal and its approaches, were obliged by an act of the New York State Legislature in 1903 to substitute within five years some form of motive power other than steam for the operation of the Park Avenue tunnel. The New York Central decided to elec-



Dense traffic is handled on the Long Island Railroad's network of electrified lines

trify this terminal, together with those parts of the two main routes of its system which served the suburban territory. The system adopted was the 650-volt d.c. third rail. Suburban service, which now extends to Croton on the main line and to North White Plains on the Harlem division, is handled with multiple-unit motor cars, equipped with two 200-hp. motors. Some trailers were originally used, but these have since been equipped with motors, making a total at present of 325 motor cars in this service. The latest type cars are of steel, weighing approximately 65 tons each and seating 100 passengers. Train make-up varies from two to twelve cars. Energy for this electrification is entirely supplied from the railroad's own generating stations.

Suburban service on the New York, New Haven & Hartford Railroad system from New York terminates at

executives foresaw the necessity for selecting a system which in the future could be extended to include all classes and requirements of railroad service, heavy through passenger, heavy main line freight, and the operation of large terminal freight yards, as well as the suburban passenger service. It was this prospect which, after careful consideration of the various systems available, led to the adoption of the 11,000-volt, single-phase a.c. system for electrification.

For that time it was a bold move and much pioneering work was done in the early years of operation, but there have never been any doubts in the minds of those responsible for its operation concerning the wisdom of the choice made. Today the successful electric operation of more than 650 miles of track covering more than 150 miles of route, over which all classes of service operate,



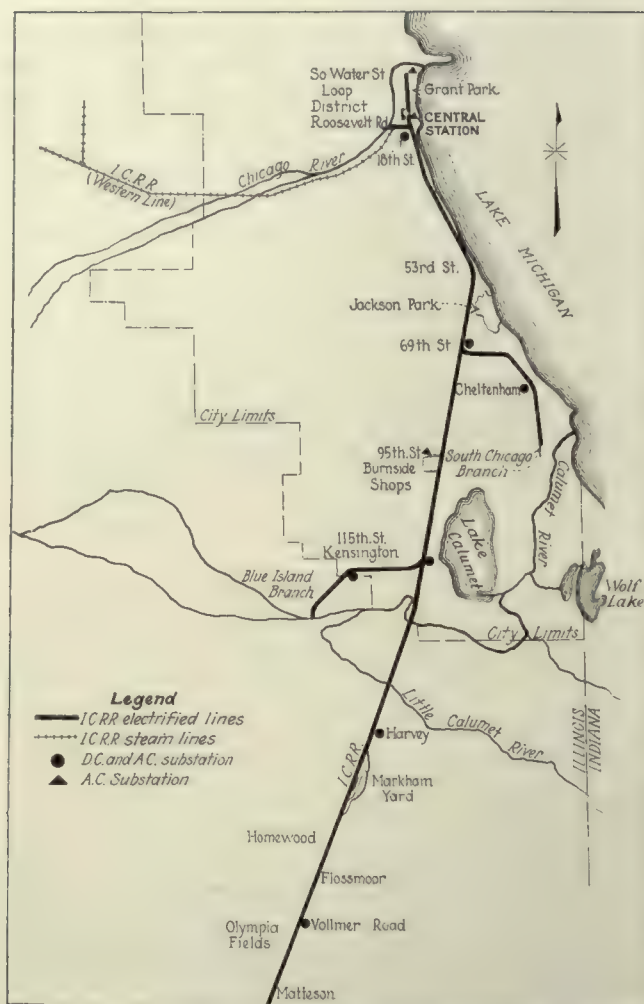
Illinois Central electrified lines use d.c. overhead system

several fairly large communities distributed along its main line, New Rochelle, Port Chester and Stamford. Steam locomotive terminals were maintained at these points for this service prior to electrification. Two courses were open to the New Haven in connection with its use of the electrified Grand Central Terminal. It could establish an engine change terminal at Woodlawn, where its line joins the Harlem division of the New York Central, and haul all trains from there by means of 600-volt d.c. locomotives, or it could electrify its own line to include all of its suburban service. Investigation of the first course showed that it would be very costly to acquire the property necessary for such a terminal, which would be adjacent to highly improved park and residential areas, and that such a terminal would create intolerable delays to the suburban service, especially during rush hours, for the power change. Further, the number of motive power units required would not be appreciably less than would be required for the complete electrification of the various suburban services involved, so that the latter course was clearly indicated and was decided upon.

It would have been perhaps the easier course to have followed the plans of the terminal company and to have adopted the 650-volt d.c. system, but the New Haven

from the 4,000-ton freight train to the single motor car; from the high-speed 180-ton locomotive, with the all Pullman limited, to the 80-ton switcher, with its drag of freight cars in the yard, places the New Haven electrification foremost in the world, not only on account of the magnitude of the traffic electrically handled, but also because it is the only electrified system on which all these classes of service are being electrically operated at the present time.

Because of the large investment in new passenger equipment for suburban service just prior to the electrification, this service was handled for some years after the inauguration of electric operation by means of electric locomotives. Motor cars and trailers with multiple-unit control have gradually been substituted for this service, until at present there are 63 motor cars and 104 trailers in this service, which take care of practically all the New Rochelle and Port Chester business, as well as a large part of the Stamford business. All cars are of steel and, with the exception of six, are equipped for operation on the 650-volt d.c. third rail of the Grand Central Terminal, as well as for the 11,000-volt main line. The latest motor cars are of dimensions approximating the standard steel vestibuled railroad coach, weigh approximately 87 tons each and have a seating



Traffic in Chicago suburban zone of Illinois Central Railroad is handled by multiple-unit electric equipment

capacity of 120 passengers each, with a three and two seat arrangement. Each motor car is equipped with four 175-hp. motors and is capable of hauling two trailers



Electrified lines of the New Haven and New York Central railroads serve an extensive area in New York and Connecticut

Trains up to ten cars are made up in the proportion of at least 33 per cent motor cars.

Considering the large seating capacity of these cars and that one motor car operates two trailers, the total weight per passenger is very light, notwithstanding the fact that the motor car must carry both a.c. and d.c. control apparatus. All cars are of course lighted and heated electrically. The energy for this electrification is supplied partly from the railroad's own generating station and partly purchased.

The Southern Pacific, New York, Westchester & Boston and Staten Island electrifications belong properly in the category of rapid transit lines and are mentioned merely to show that the steam railroads of which these systems are subsidiary lines have availed themselves of all the advantages that electrification gives to this type of service. In each of these instances the choice made of system of electric traction was largely governed by the other systems with which they connect at present, or may connect in the not distant future.

PENNSYLVANIA RAILROAD ELECTRIFICATION RELIEVED CONGESTION

For several years prior to 1914 the Broad Street Terminal of the Pennsylvania in Philadelphia was congested by suburban traffic. Electrification was decided upon to relieve this terminal congestion, to include first the main line suburban service to Paoli, which was effected in 1915, and later the service on the Chestnut Hill branch, which was completed in 1918. Multiple-unit cars were adopted for this service, and by their use train movements through the throat of this terminal, where the congestion was the greatest, were reduced between 16 and 20 per cent, due to the fact that the movements of the steam locomotives to and from their terminal beyond this throat were entirely eliminated. Further, because the multiple-unit cars were ready for departure very soon after their arrival, the terminal capacity was increased by the equivalent of two additional platform tracks, or 12½ per cent. This increase in terminal capacity and relief from congestion has been sufficient to take care of the growth during the past twelve years, and has postponed for this period the large increase in terminal capacity and the

major changes to this terminal now being contemplated by the Pennsylvania. Plans are now made, and construction is already under way for the similar electrification of the suburban service on the main line south to Wilmington, as well as on the Westchester branch.

Choice of the 11,000-volt, single-phase a.c. system of electric traction was, as in the case of the New Haven, not based so much upon the suburban requirements alone as on its being the system best adapted to the future general electrification plans of the railroad.

Cars used in this service are of the standard type of Pennsylvania steel coach, re-equipped with one new truck, on which are mounted two 225-hp., single-phase motors, with multiple-unit control. A total of 138 cars so equipped are now in operation for this service. The

seating capacity is 68 passengers per car, and the weight, with equipment, is approximately 60 tons. No trail cars are operated in these trains, which are made up of from two to eight cars. All the power for this service is purchased from the Philadelphia Electric Company.

ILLINOIS CENTRAL ELECTRIFICATION USES 1,500 VOLTS D.C.

The most recent steam railroad suburban electrification is that of the Illinois Central, in Chicago, which was placed in regular service in August, 1926. For many years this railroad has operated a frequent steam train schedule for the heavy suburban traffic which has been growing on its main line as far south as Matteson, and

are made up of from two to eight cars. Energy for this service is all purchased on a 1,500-volt d.c. basis from the Commonwealth Edison System.

As compared with the through traffic which usually shares the same terminal, suburban service fails to bear anything like its proper share of the cost of facilities required and used. Cars, tracks, terminal space, power supply, transmission and distribution systems, signal systems; in fact, all facilities must be provided for the maximum peak demand, which is out of all proportion to that of the through traffic.

Thus, the load factor is poor. It means that a large number of cars and locomotives must be idle from the morning rush hour until used again during the evening



*Yard outside Pennsylvania Station, New York City, the western terminus
of the Long Island Railroad*

on the South Chicago and Blue Island branches which join the main line at Kensington and 67th Street, respectively. In 1919, by agreement with the City Council of Chicago, the Illinois Central committed itself to the electrification of this suburban service prior to February, 1927. After a study of the various systems available, the 1,500-volt d.c. system was selected on the basis "that it was a terminal electrification only, with no prospects for immediate extension over adjacent main line divisions." Energy is collected from an overhead contact system. Notable improvements over the former steam service have been effected by means of electrification. The running time between terminals has been decreased from 10 to 24 per cent and the service has been greatly improved not only by faster and more frequent trains but in the matter of greater comfort and safety to the commuter, as well. The magnitude of the service provided for is shown from the fact that 482 trains are operated each weekday, carrying a daily average total of 80,000 revenue passengers. In addition to the above, 72 trains of the Chicago, South Shore & South Bend operate each weekday over this system from Kensington into the terminal.

This traffic is handled entirely by 130 motor cars, to which are permanently coupled one trailer each. These cars seat 84 passengers each. The motor cars weigh approximately 70 tons and the trailers 44 tons. The former are equipped with four 250-hp. motors and trains

rush hour, and then remain idle again through the night. Terminal tracks and leads must be of a capacity to handle this peak traffic, even to the extent of signaling and using inbound tracks for outbound service, and vice-versa. Signaling is more expensive, blocks must be shorter for the short headway required to handle the business.

LOAD FACTOR POOR IN SUBURBAN SERVICE

Power supply and transmission and distribution systems must be designed for the peak loads. In the case of the earlier roads to electrify, the power demands could not be economically secured other than from railroad-owned generating stations. The roads which were obliged to make these heavy original investments for power supply have not yet found it desirable or economical to give up the use of these stations in favor of purchasing all their power, because of the high total demand charge which would result until such plants are amortized. Of late years, the development of large capacity central power stations has been so rapid that railroad demands, however large, are small in comparison with the average central station loads. Thus the power-producing companies are in a more favorable position to supply the railroad demands, and it may now be more desirable for the railroads to purchase all their power rather than make the heavy capital investment for a supply of their own.

Meeting the Demands for

P. S. ARKWRIGHT

*President
Georgia Power Company
Atlanta, Ga.*



questions which only the future can answer. I have faith that they will be answered, for I have faith in the industry and in the men at the head of it. But, with all this uncertainty as to the future, there is one thing that can be said now, positively and with conviction. There is no place in the industry for the hidebound executive. There is no hope for the executive with plodding horse car ideas in this high speed era. Those who are capable of meeting the demand for modern transportation by modern methods will succeed. Those who attempt to meet it with antiquated equipment and antiquated ideas are doomed to failure.

urious, and no standing should be permitted. These facilities cannot be furnished for 25 cents if the route is more than 6 miles. Equal facilities could be furnished by electric cars, but no advantage in the way of increased speed could be provided on city lines.

ROBERT I. TODD

*President
Indianapolis Street Railway
Indianapolis, Ind.*



THERE is a demand for better transportation, and meeting this demand is the job ahead of the electric railway industry. The progress made during the past few years is remarkable, but we must be prepared for still greater changes in the future. The desires and wishes of the public must be met. We must accept this as the cardinal principle of our success. It applies to us as much as it does to the dealer in shoes or cigarettes or structural steel. And the desire of the public is for quality transportation, a better quality than we have been providing. The great number of automobiles on our streets is all the proof we need that the public wants better transportation, that it is willing to pay a price far in excess of the fare we have asked, and that we have been negligent in permitting the automobiles to capture so large a place in a field which formerly was almost exclusively our own.

How to meet this demand is our problem. Is it through a more luxurious vehicle? Is it through a different type of vehicle? Is it through extension of supplemental motor coach facilities to give our service some of the range and flexibility which are among the chief attractions of the private automobile? Or is it through some entirely new idea in public transportation yet to be developed? These are

J. H. HANNA

*President
Capital Traction Company,
Washington, D. C.*



I HAVE felt for some time that competition with privately owned automobiles can be met only by furnishing, at a reasonable but sufficient price, facilities which are more convenient and comfortable than can possibly be furnished at prevailing street car fares. Our experience with the 25-cent parlor car bus, while not particularly encouraging financially, has shown that such a service is popular and meets a very general demand. Its success depends on its superiority over first-class street car service. Operators must be men picked for their courtesy, equipment must be comfortable and even lux-

CONFRONTED as the industry is to-day by the keenest kind of competition from the privately owned automobile and the independently operated bus, the two big things to be accomplished seem to be the rendering of such street railway service as will attract the bus rider to the street car and persuade the owner of the automobile to use the street car instead of his automobile.

If this result is to be accomplished the street car must be made as attractive as possible in point of comfort, safety and speed. Better seats, such as those of the bucket type; improved trucks and running gear, clean, fresh paint and good maintenance, all appeal to the traveling public. Improved power supply reduces the running time, particularly in rush hours.

Decreased earnings, which have been experienced by some of the companies throughout the country, make it difficult to expend large sums for equipment, but the present equipment should be improved in every way

atives Think on

Better Transportation

possible to make the cars more comfortable and attractive.

It is conceded that where buses are needed to supplement the street car service they should be owned and controlled by the street railway company so that the service may be coordinated. The running of certain street cars or buses without stops as an express service to distant points, followed by local service, is being considered in many of our cities.

There is no doubt that there are opportunities for improvement of the street railway service in every city, and a constant study of these conditions is bound to improve the service and increase the number of riders.

T. E. MITTEN

*President
Mitten Management, Inc.
Philadelphia, Pa.*



WHERE the city transportation system has fallen short of success you will find that it has failed to keep its product on a par with the advancing tastes of its customers. The growth of the seat-for-a-fare motor bus and the door-to-door taxicab is not an accident. It is the expression of that same popular longing for greater comfort exemplified in those great American institutions, the bathtub and the automobile. Public transportation systems must develop according to this public taste or go to the wall. They must not only go into the bus and taxicab business, but must increasingly approach "a seat

for every passenger" as a standard in street car and subway-elevated service.

T. FITZGERALD

*Vice-President
Pittsburgh Railways
Pittsburgh, Pa.*



FACTORS which affect the patronage of transportation systems are appearance, speed, comfort, convenience, reliability and economy. If the prestige of a street railway and its public relations are sufficiently good, there is no physical reason why street car service should not be reasonably speedy and also offer the best in appearance, comfort, reliability and convenience at a price greatly below the cost of any other form of transportation.

Few street railways under present-day conditions can compete with private automobiles in appearance, speed, comfort and convenience; but, so far as reliability and economy are concerned, street car service greatly excels. Because lack of credit makes unavailable the large sums of money necessary to improve these factors, many former street car patrons are using private automobiles. These private facilities are using the highways to the disadvantage of all forms of mass transportation facilities to an increasing degree. The immediate problem seems to be to furnish a mass transportation service that will offer effective competition with the private automobile and to such an

extent as to reduce congestion and interference with the street cars.

This competition should probably take the form of a special service as nearly comparable to private car service as possible, and must, of course, be performed at a special rate.

In the matter of economy the street car has a tremendous advantage, and if street railway managements can improve in the other elements mentioned, as I believe they can, the earnings, prosperity and service of street railways of the country will win out over the automobile competition that is now affecting them so seriously. After this competition reaches its peak street railway traffic should resume the upward trend apparent before the year 1924.

W. E. WOOD

*President
Virginia Electric & Power Company
Richmond, Va.*



LOCAL low-fare basic transportation service is essential to the welfare, growth and comfort of all cities of any considerable size. The widespread use of private automobiles with their many attractive qualities has had a tendency to cause the riding public to misunderstand the usefulness and essentiality of our basic transportation systems. The difficulty of earning a reasonable return on our investment in these systems has caused us to fail to keep pace

with the added and increasing comforts and attractiveness of the private automobile. There are many transportation requirements that our systems can fill more conveniently, comfortably and economically than the private automobile, and these riders, enough to assure successful and growing systems, are the ones we must hold or attract.

To do this it is necessary to provide not only good but attractive service and strive constantly to improve this; then, sell the good quality, convenience and economy of our service to the riding public. At the same time convince the general public of the value of our service to the welfare of the community and that our company and its employees are valuable citizens. Our equipment must be made attractive, comfortable and noiseless; our tracks smooth; our men efficient, courteous, clean and alert; both speed and safety must be obtained and the service must be sufficient and regular. Ingenuity in design and operation in keeping ahead of the trend of the times will keep our important place in the scheme of affairs and ultimately assure a warranted prosperity.

DEL A. SMITH

*General Manager
Department of Street Railways
City of Detroit, Detroit, Mich.*



AS TO the most pertinent factors in meeting the demand for better transportation, I will say that the imperative need of the industry today is more "Ponce de Leons" in the operating personnel. Our antiquated methods and ideas, inherited from the old school, must be immersed in "the fountain of youth." After this process of rejuvenation, we are then ready to consider the four cardinal attributes in the popularization of the transportation system, namely: accessibility, dependability, speed and comfort.

As the picture presents itself to me, the proper co-ordination of these qualities, together with the versatility of the operator in adapting himself to new ideas, is the only sure method of increasing patronage and winning favor in the ever-changing mind of the public.

D. W. HENDERSON

*General Superintendent of Railways
Seattle Municipal Street Railway
Seattle, Wash.*



THROUGH careful observation it is my opinion that the street railway industry is coming back into its own—perhaps not in all cities but in the majority of them. One cause for this is the automobile congestion and the difficulties in finding parking space in most of our cities.

The following are a few of the possibilities which should tend to improve and build up the industry:

First: New light-weight cars with exit and entrance built as low as possible in order to save time in the loading and unloading, seats upholstered and arranged for the convenience and comfort of passengers, cars properly geared and equipped with sufficient power to increase the speed over that of the present cars and equipment painted so as to be attractive to the public are all very necessary.

Second: Companies should take the public into their confidence and give it data as to railway conditions. They should also educate the public into realizing that without the street car industry the cities would not develop and grow by leaps and bounds as some of them have in the past.

Third: It is now a demonstrated fact that bus operation should be co-ordinated with the street railway in such a way as to give regular and dependable service, using the best kind of equipment on the market and making direct connection with street cars at transfer points.

Fourth: Street railway companies should be careful not to raise the

fare to the point where it might discourage the public from riding the cars. We would say that any fare averaging more than 8 cents would be prohibitive, except for interurban service.

A. W. McLIMONT

*President and General Manager
Winnipeg Electric Company
Winnipeg, Man., Canada*

WITH the ever-increasing measure of comfort afforded by motor buses, and automobiles in particular, a new mark has been set for all transportation agencies to note and to endeavor to copy and surpass if possible. Apparently the riding public is not so much concerned with the cost as it is with the standard of service, and this is proved by the increasing number of higher priced automobiles which the public is buying. The public looks for speed, comfort and convenience in transportation, whether by automobile or by street car. The quality of service appears to be more important than the fare.

The problem before the street railway industry is: How can these qualities in service be attained? To me it seems that there must be an improvement in the construction of our street car tracks. A good deal of the track installed in the past is too light to serve present-day transportation needs. The rolling stock in many



cases has been too heavy. Unnecessary car stops must be eliminated. It is not too much to expect that in the near future a street car will be developed that will embrace most of the features of comfortable riding which are found today in the de luxe motor buses. From my experience I am convinced that the people will willingly pay a fare commensurate with the standard of service given.

Analyzing the reasons why so many street car patrons have turned to automobiles, we find that one of the principal reasons is facility of travel:

This element of competition must be met by street car operators speeding up service in every way possible, and where practicable providing supplementary bus lines. In the speeding up of electric railway service car manufacturers have an opportunity to develop lighter and more flexible vehicles—cars which are able to accelerate quickly and which can be brought to a quick stop.

F. G. BUFFE

*Vice-President in Charge of Operations
Kansas City Public Service Company
Kansas City, Mo.*



portation men over night, constantly planning to fit urban transportation to the needs and demands of the people, and supplying services other than the low fare, base service wherever demanded and supported.

One-man operation on heavy lines in large cities is a success, and like all labor-saving inventions it must be adopted in the end. No community and no transportation system can afford to pay two men for a job that one can handle. One-man operation makes possible increased frequency and decreased loads, which brings us another step nearer the ultimate goal of a seat for every passenger.

When the very best possible service is given for the fare paid, the next step is to determine in each community whether or not the people are primarily interested in the very lowest fare and ordinary, good service, or in the very finest service money can produce at a slightly increased unit cost. The American people in every other direction have placed the emphasis on service and quality, with price secondary. It is very possible that this attitude will develop in transportation.

GEORGE BAKER ANDERSON

*Manager of Transportation
Los Angeles Railway
Los Angeles, Cal.*

IF YOU enter a grocery store and ask the proprietor for applesauce, and he informs you that he has no applesauce but can give you some excellent cream cheese, you will be inclined to think in the vernacular, "Rotten management!"

But if he has the applesauce, and if you pay for it, assuming that it is good, fresh applesauce, only to discover upon tasting that it has turned sour, or has been made of partly decayed apples, you will have even greater warrant for concluding, "Rotten!"

The needs and desires of those who, either through choice or necessity, expect a public transportation company to deliver what its customers want and not attempt to foist unwelcome substitutes upon them must be met as nearly as possible by the seller if he aims to attract trade. His applesauce must be at least acceptable to the palate. Otherwise some of his customers will quit him, and those who stick will do so because of dire necessity, not because they like his wares. I know of nothing that will build up and popularize a transportation system more quickly and more

surely than a satisfactory response to the public demand.

We can be courteous as we hand over the article purchased, and we can be sure that it will be difficult for the purchaser to find a much better article elsewhere.

Then as to speed—it *must be made*. Unnecessary congestion is very an-



noying and also costly and when fully understood by a community will not long be tolerated.

Above all other factors in meeting the demand for better transportation, conceding that progressive transportation managers are in accord on the essentials within the purview of corporate management, is leadership of the public—enlightenment and leadership.

RICHARD MERIWETHER

*Vice-President and General Manager
Dallas Railway & Terminal
Company, Dallas, Tex.*



IT IS difficult to discuss the outlook before the street railway industry and the matter of meeting the demands for better transportation without being conscious of the credit situation which has confronted the street railways for the past ten years or more, due to the difficulty of meeting the ever-increasing cost of operation while subject to the control of regulating bodies hesitant always to grant adequate fares, and, in addition, the

CERTAINLY the industry can report progress in its efforts toward meeting the demand for better transportation. From every quarter come reports of rehabilitation and modernization. The old complaint that street railway operation was in a rut certainly cannot now be made. There has been a mental modernizing as well as a physical. However, the industry is not yet in the position of Alexander the Great, who wept because there were no more worlds to conquer. There is still much to do to carry on the program now started, as well as to venture into the field of new and comparatively untried ideas.

The public has accepted the fact that nothing can supplant street railway service for mass transportation. Very seldom nowadays is this fundamental dispute. Better service with modern equipment is being met with approbation, good will and increased riding. Aggressive advertising campaigns are being conducted. The bus is being fitted into the scheme of things, and is taking its place as the vehicle for supplying a preferential seat for every passenger service for the more exacting. At least two large companies are in the cab business. In every direction we have seen street car men become trans-

constant inroads of the private automobile on the business of the street railway.

During this period the street railway operator has had to contend with that vicious circle of circumstances wherein he could not secure new capital for necessary improvements to meet the demands for better transportation, due to insufficient net earnings. On the other hand, he could not increase his net earnings by reason of the fact that he could not obtain new capital to improve his property and meet the new and changing conditions in the transportation field.

As I see it, those street railways that have not already done so must first obtain an adequate fare, which, of course, will result in establishment of credit and earnings sufficient to rehabilitate the properties. This will mean the rebuilding of tracks and the scrapping of antiquated equipment, which must be replaced by inviting and comfortable cars.

The bus will constitute an increasingly effective and useful vehicle for public transportation. Especially will this be so for furnishing express service into outlying districts, which will meet a demand that surface cars cannot do. Through the use of a combination of buses and street cars, the former to render a special and improved type of service at a higher rate of fare, and the street car to meet the mass transportation situation, the local transportation companies should be in a position to furnish the variety and kind of transportation desired by the public.

D. W. PONTIUS

*Vice-President and General Manager
Pacific Electric Railway
Los Angeles, Cal.*

IN STATING my views concerning the outlook of the electric railway industry I am reminded of the story concerning a young lieutenant who was recommended to Napoleon for promotion because of rare skill and courage he had exhibited in a battle a few days before. "Splendid," the great Napoleon is said to have replied, "but what did he do the next day?"

More than ever before is impressed upon the wide-awake electric railway management the fact that there can be no resting upon past laurels and achievements. The well-being of the industry depends upon our advancing with the times.

The Pacific Electric Railway from



its inception has carried upon its emblem "Comfort—Speed—Safety," and I know of no other three elements now so essential to the industry.

For comfort of patrons constant consideration must be given to improvement of car design, taking into account factors of boarding, riding and leaving cars. Whether in electric cars or motor coaches, the trend is toward more comfortable seats, the modern automobile having created new ideas of comfort.

Further, the automobile has developed a greater desire for speed, and nothing should be left undone to shorten schedules. The matter of a few minutes' running time is a factor that will cause thousands to decide whether they will use their private automobile or the street car.

Safety is the one feature in which electric railways have kept abreast, and the use of steel equipment, wherever possible, together with modern signals and safety appliances, is a necessity with which we are all acquainted.

"Comfort—Speed—Safety" are the three factors that are ever before the officers of this company. In my judgment they constitute today, more than ever before, the elements most essential in "Meeting the Demand for Better Transportation."

H. S. ROBERTSON

*President
Denver Tramway Corporation
Denver, Col.*

SOME form of mass transportation is a necessity. That fact is indisputable. The meeting of this demand without financial loss and with a reasonable profit is the problem.

The public and governmental authorities have a clearer and more comprehensive understanding of the situation than existed a few years ago and, while there remains much to do in an educational way, the fact that the average fare is now approxi-

mately 7.9223 cents, and in many localities unjust burdens such as paving have been removed, warrants the conclusion that not only has the necessity for mass transportation been recognized but also the fact that it cannot be rendered except upon a sound business basis.

Traffic congestion, coupled with more stringent parking regulations, will make the use of the private automobile less convenient. Convenience rather than expense, seems to be the important factor with a large number of people, and in view of this the opportunity is now at hand for the industry to demonstrate that mass transportation facilities are not only the safest and most comfortable but under present conditions, the most desirable and convenient.

In order to accomplish this the business must be conducted in the light of these changed conditions. This involves rendering adequate service, which from the standpoint of the public means good track and that equipment be kept clean and neat in its appearance, and made as easy riding and noiseless as possible. In other words, I do not believe the



public expects extravagant expenditures in this direction, but it does demand something that is up to date and that shows improvement and development, and a keeping up with the progress and advancement that transportation has made since the advent of the automobile.

The rate of fare must be sufficient to cover the cost of the service, and yet be held as low as possible consistent with proper and economical operation.

The industry must recognize that there are certain fundamental and underlying principles that are applicable to all companies, and the recognition of an unsound basic principle is not only poor business but affords those opposed to giving the industry a square deal the opportunity of citing the case as a precedent.



Success of

*Public Square, Cleveland, the midpoint
of the Carnegie-Clifton double-deck bus
line of the Cleveland Railway*

Double-Deck Bus

Depends on Special Conditions

By J. H. ALEXANDER
President Cleveland Railway

OPERATION of buses is a necessary part of the transportation service which should be rendered by any street railway system in a metropolitan area. Buses do not and never can take the place of the street car for mass transportation, nor is it desirable that they should. It is our belief, however, that street railway managements generally should use buses for certain types of service, augmenting and supplementing rail service, and that by so doing the operation of their systems can be more efficient, economical and satisfactory to the public. Double-deck buses are valuable under conditions suited to their operation, but it must be admitted that their field of usefulness is limited.

The coming of the private automobile brought about a new period in local transportation in Cleveland, as it did generally over the country. The number of street

car passengers carried in Cleveland during the years of 1900-1925 decreased steadily. Now it appears that the introduction of buses is causing a change in the riding habit. Instead of a decrease for the year 1926 as compared with 1925 there was an increase of 0.71 per cent in traffic.

The coming of the buses marks still another change—a transformation from the day when people own and operate their own transportation vehicles. The extent of patronage of the double-deckers, and especially the type of patronage, indicates that people are readjusting their habits of travel even to the extent of leaving their automobiles in the garage a good portion of the time. There is a growing discrimination as to how and when to use the bus, street car or private machine.

The double-deck bus line has not taken traffic away

from street car lines notwithstanding that it parallels them within a block throughout its entire length of 9.68 miles. Much to the surprise of early guessers, street car lines paralleling the main bus route have increased in patronage at a time when some other rail routes showed a decrease.

For some time the double-deck coach line has been showing a very substantial profit, income per month varying between 50 cents and 56 cents per coach-mile.

Analyzing the reasons for the ready acceptance of double-deck bus service and their constantly increasing popularity, certain points are apparent. The speed at which the coaches are operated, namely, between 12 and 13 m.p.h. during the base hours and approximately 11.5 m.p.h. in the rush hours, constituting what is probably the fastest double-deck line operation in the country, is especially attractive. Safety has not been sacrificed. Although this speed may be detrimental to equipment we believe that the actual attractiveness to passengers is more than sufficient to cover any additional maintenance cost. Another factor which has been important in bus operation is the skip-stop system, stops averaging approximately six per mile. The fare on double-deck lines is 10 cents for a through ride, there being no zone system such as exists on the cars requiring passengers to pay additional fare after passing the Public Square. Free transfers are issued to passengers originally boarding motor coaches, which are good as full fare on any intersecting car or coach line. These transfers are accepted as full fare from intersecting coach lines, while a 2-cent additional charge is made from intersecting car lines, where the fare is 7 cents with a 1 cent charge for transfers.

The rule of a seat for every passenger was adopted at the time the double-deck route was established and was continued until the limit of the number of buses available had been reached. Then, due to shortage of equipment,

it was decided to permit passengers to stand with a limit of five per coach. This rule is now in effect and in general seems to be giving satisfaction.

We believe that there is a future for trunk lines of the double-deck type, but these lines should be confined to districts in which patrons reside who are able to pay a higher fare, and for the most part to boulevards and streets not having car lines. There is also a future for double-deck operation on lines running through part and sections of the city of interest to visitors.

USED AT BUFFALO ONLY IN RUSH HOURS

At Buffalo, N. Y., the International Railway has found that double-deck buses are best used to supplement single-deck bus service during rush hours. The one route on which double-deckers are used serves Delaware Avenue from Church Street through Buffalo and the adjoining village of Kenmore. Delaware Avenue is a high-class residential street, many large estates bordering on it. At its southern end is a specialty shopping section, while in the village of Kenmore there is a thriving local business center.

Riding, however, has not been heavy enough to warrant service more frequently than at ten-minute intervals, except during rush hours. Furthermore, climatic conditions in Buffalo are not favorable during nine months of the year for operation of open or semi-inclosed double-deck buses. As a result the International Railway began on Aug. 14, 1927, to operate single-deck buses at more frequent intervals but supplemented during rush hours by the double-deckers.

POPULAR FOR CHARTERED TRIPS IN ATLANTA

Establishment of double-deck bus service in Atlanta by the Georgia Power Company provided high-class transportation to two residential sections with no car lines. Because of the bitter feeling that had existed the



Double-deck buses are used in rush hours on the Delaware Avenue route by the International Railway, Buffalo, N. Y.



Chartered service is the principal use made of double-deck buses by the Georgia Power Company

company was influenced to select a coach of larger capacity than the actual transportation needs required, with hopes of building up sufficient business to justify their operation. After the first year, however, the loss was so great that it was necessary to substitute smaller coaches. Accordingly, ten single-deck coaches were purchased and used on the base schedules. The fifteen double-deck coaches are helping to carry the rush-hour crowds and are also much in demand, under a chartering arrangement, for picnic parties, convention delegations and other outings.

BALTIMORE USES DOUBLE-DECKERS ON ONE ROUTE

Operation of double-deck buses in Baltimore is confined almost entirely to the Charles Street route. That portion of the street over which the United Railways & Electric Company operates double-deck buses has the same significance that Fifth Avenue has in New York. At the northern or outer terminus of the bus line, about 3 miles from the center of the shopping district, there is a high-class apartment house development and Johns Hopkins University. Just north of the terminus of the bus lines is the entrance to Roland Park and Guilford, a fine residential section.

From a transportation point of view the section served by the bus line is adequately taken care of by a car line. However, a slightly greater convenience is provided in that the bus line remains entirely on Charles Street. The rate of fare on the street car is $7\frac{1}{2}$ cents, with a 4-cent "half" fare, a 5-cent school ticket and a universal transfer system. The fare on the double-deck buses is 10 cents with no reduced fares or no transfers to street cars or other bus lines.

The operation on Charles Street is entirely double-deck, and with the exception of the summer months when travel is light the line uses eight on the base and eleven or twelve buses on the peak, with an eight-minute and a five-minute headway, respectively. In good weather the open-top buses are the more popular, but the semi-inclosed top is sufficiently satisfactory under that condition, and the advantage that the closed upper deck can be used to capacity during inclement weather more

than justifies its use. For a climate such as Baltimore has there seems no justification for the expensive and heavy totally inclosed double-deck buses.

The following tabulation shows the number of passengers carried from 1915 to 1926 on the Charles Street line:

Year	Passengers	Effective	Fare	Additional Equipment
1915	484,800	July 25	5 cents	(Single-deck buses in use)
1916	1,438,900			
1917	1,515,000			
1918	1,950,300	Nov. 10	6 cents	
1919	1,958,900	Oct. 1	6 5 cents	
1920	2,026,300	Jan. 1	7 cents	
1921	2,165,100			
1922	2,214,600	July 1	10 cents	Four double-deck buses
1923	2,003,500	July 1		Four double-deck buses
1924	2,131,800			
1925	2,333,800	July 1		Six double-deck buses
1926	2,301,200			

Up to June 30, 1922, the accumulated deficit on this route was \$136,960.61. When the fare was changed to 10 cents the line immediately became profitable.

The factors which make the operation profitable are: first, the 10-cent fare; second, the short route; and third, the comparatively good load factor. No attempt has been made to take care of all the peak-load traffic that could be obtained, as this function is left to the car lines. The comparatively low investment, together with the off-peak shoppers and moving picture and theater crowds, makes a profitable operation. In other words the bus line takes the cream of the business.

P. R. T. HAS 250 DOUBLE-DECK BUSES

Extensive use of double-deck buses by the Philadelphia Rapid Transit Company in Philadelphia has proved to be a success. Bus operation began in September, 1923, with ten double-deck buses that were placed in service on 5 miles of route on Roosevelt Boulevard. When all the new buses that are on order have been delivered the company will have 565 buses, of which 250 will be double-deck.

Three city routes and two intercity routes, the latter

between Philadelphia and Camden, N. J., are being regularly operated at the present time with double-deck equipment. In addition, double-deck buses are used in tripper service during rush-hour periods on three other city routes. The one-way length of route over which double-deck buses are operated is 49.35 miles, 10.5 of which is for tripper service only. The average operating speed of the double-deck routes is about 10 m.p.h.

OPERATION PROFITABLE IN NEW JERSEY AND KANSAS CITY

A somewhat different type of double-deck bus operation has been established in certain New Jersey seashort resorts by the Coast Cities Railway and its subsidiary, the Atlantic Coast Transportation Company. This operation has been doing well financially despite the rainy weather that has been prevalent all over the East this summer. One rail line has been rerouted in Asbury Park, the center of the system, so as to save considerable car mileage. The buses are operated on a 10-cent zone fare system. While gross revenues have been less on account of the bad weather, the economies incident to the rerouting have made it possible to show a relatively small recession in the net.

The Kansas City Public Service Company has operated two double-deck bus lines since November, 1925. Each of these routes is over a boulevard and not in direct competition with car lines. They tap desirable apartment and small residential districts, running into the downtown district. One of these lines is 5.9 miles in length; the other is 6.5. Service is given by seven buses on one and eight on the other. The average rush headway is twelve minutes; base, thirteen minutes, and the afternoon rush ten. A total of 2,070 bus-miles a day are operated. The earnings for the seven months of 1927 were 34.2 cents per mile and the operating expense 29.0 cents.

The company also controls the Gray Line sightseeing franchise, and very frequently double-deckers are used in this service to accommodate large parties.

RESIDENTIAL DISTRICTS SERVED IN LOS ANGELES AND MILWAUKEE

Double-deck bus operations in Los Angeles are part of the rail operations, generally speaking, transfers being issued to the rail lines, and taxes being paid in exactly the same way. The operations are entirely within the

city of Los Angeles, and there are but two lines using double-deck buses. The Pacific Electric Railway and the Los Angeles Railway have formed the Los Angeles Motor Bus Company, which operates one of the lines through territory served by both companies, while the other line is operated solely by the Los Angeles Railway. Both lines commence in the downtown business district, and extend into the residential district, although one of them passes the edge of the business district of Hollywood. The territory is well built up, but is not the most densely populated area in the city. Aside from short grades of 4 per cent, the streets are nearly level and improved with some form of permanent paving. Outside of some six to eight blocks in the downtown district skip stops, spaced six to eight to a mile, are used on one line, while on the other stops are still made at each street intersection. The average speed is approximately 11 m.p.h., including layover. The running time on one of the routes, 7 miles in length, changes six times per day, and varies from 29 to 35 minutes without layover.

The rate of fare on both double-deck lines is 10 cents, including transfer to car lines and also to other bus lines. To date these double-deck buses have not earned operating expenses. The reason for the continuing losses appears to lie in the low fare. While the trend of revenue is upward, the increased revenue off-peak, when seats are available and operating expenses are not increased, is offset by the increase in expenses during peak periods, when additional equipment is necessary.

Double-deck buses were purchased and placed in de luxe service by the Milwaukee Electric Railway & Light Company, Milwaukee, Wis., during the summer of 1923. A route was chosen beginning in a residential section, and passing through the downtown district to another residential neighborhood. It was operated as an independent service from other company transportation facilities, although it paralleled one of the company's car lines for parts of the route. The rate of fare was established at 10 cents with a seat for every passenger.

The company's experience after four years has been that Milwaukee traffic does not require double-deck buses for all-day service, but only during morning and evening rush hours. Even at these times it is believed that single-deck buses operated at more frequent headway would stimulate rush-hour business, although there is a question as to whether the increased investment in buses for peak business would be justified.

Kansas City Public Service Company makes extensive use of double-deck buses for sightseeing



Pittsburgh Motor Coach Company operates de luxe buses on four routes between outlying residential districts and the center of the city



Winning the Automobile User With **De Luxe Coaches**

By THOMAS W. NOONAN

General Manager Pittsburgh Motor Coach Company

HUNDREDS of electric railways throughout America have made extensive additions to their systems or replacements of rail service by means of motor buses operated at trolley fares or at little more than trolley fares. A few of these companies, like those at Pittsburgh, Toronto, Washington and Cincinnati, have also undertaken high-fare, de luxe coach service of express character. In many ways this is a most attractive proposition.

Pittsburgh's situation with respect to the operation of bus service is in a class by itself. A total of 15.8 single-track miles have been removed since the end of the receivership on Jan. 31, 1924. Most of this mileage was of the "hold the franchise" variety and the service over

the routes abandoned has not been replaced by that of buses. More track is booked for abandonment in line with the city paving schedule. Here and there track has been doubled or connecting curves added, but outside of the loop on Diamond Street to alleviate downtown congestion, no new track has been built. The net situation is that the Pittsburgh Railways now operates a total of 592 single-track miles, serving more than 1,000,000 people, without a trolley-fare bus in regular service.

Three factors have made this unique situation possible:

First, the high proportion of trackage to population.

Second, the traction agreement with the city of Pittsburgh and most of the other municipalities served, which

Table I—Earnings and Expenses of Pittsburgh Motor Coach Company

Earnings	Cents per Coach-Mile		
	Jan., 1927	June, 1927	July, 1927
Passenger revenue.....	39.44	30.91	26.77
Special bus revenue.....	0.24	2.70	5.03
Advertising revenue.....	0.15	0.08	0.08
Total.....	39.83	33.69	31.88
<i>Operating Expenses and Taxes</i>			
Conducting transportation†.....	16.93	12.76	12.58
Maintenance of transportation plant and equipment.....	6.73	5.59	7.78
Traffic.....	0.05	0.47	0.43
General administration.....	1.56	1.84	1.72
Other general.....	1.85	1.75	1.62
Renewals and replacements.....	4.56	4.48	4.73
Total.....	31.68	26.89	28.86
Taxes.....	1.10	1.12	1.53
Total operation and taxes.....	32.78	28.01	30.39
Net earnings from operation.....	7.05	5.68	1.49

†Wages are 61½ cents an hour first three months; 66½ cents an hour next nine months; and 68½ cents an hour thereafter.

saves the management from the necessity of replacing track for the sake of avoiding unfair burdens. The company's obligation in lieu of paving and license fees is approximately \$800 per mile of track. Public knowledge that the company's operations are continuously scanned by the Traction Conference Board and that its profits are limited to 6 per cent return on an agreed valuation reinforces the importance of this factor.

Third, the use of de luxe coaches at a 25-cent fare on short headways to give a service that will draw people from the private automobile and so help to clear the highways for business and trolley traffic. This operation is conducted by the associated Pittsburgh Motor Coach Company.

BOTH TROLLEY AND COACH ARE SELF-SUSTAINING

The relative importance of the two classes of traffic can be gaged from the data for 1926, when the trolleys carried 396,697,675 passengers at an average fare of 5.37 cents and the coaches carried 1,149,283 passengers at a fare of 25¼ cents. The extra quarter cent comes from the higher average fare from chartered service. It is obvious that the difference in fare is great enough to produce appeals to widely different classes of patronage. Indeed, replies to our questionnaires prove that the coach traffic comes chiefly from private automobile riders, people who would otherwise not ride at all, taxi passengers and trolley riders in order of importance as named. The riders from the trolley are chiefly shoppers to whom the coach appeals as a pleasing variation from their usual shopping routine.

Table III—Summary of Operations of Pittsburgh Motor Coach Company

Route	Length Miles	Running Time—Minutes									Headway, Min.			
		Inbound			Outbound									
		Peak	Base	Eve.	Peak	Base	Eve.	Peak	Base	Eve.	Sat. Eve.			
East Liberty..	5.00	27	23	20	27	26	25	6	7½	15	..			
Squirrel Hill..	5.70	25	26	35	27	29	25	6½	11	30	15			
Point Breeze..	6.25	28	28	28	32	32	32	7½	12	30	..			
Mt. Lebanon..	6.90	33	31	30	37	34	30	10	15	30	..			

Table II—Detail of Operating Expenses, Pittsburgh Motor Coach Company, June, 1927

Conducting Transportation		Cents per Coach-Mile
Superintendence of transportation—labor.....		0.52
Superintendence of transportation—supplies and expenses..		0.65
Garage employees.....		0.34
Garage supplies and expenses.....		
Station employees.....		
Station supplies and expenses.....		
Passenger coach drivers and conductors.....		6.22
Fuel for passenger coaches.....		2.47
Lubrication for passenger coaches.....		0.04
Removal of snow and ice.....		
Transportation rent.....		1.89
Other transportation employees.....		
Other transportation supplies and expenses.....		0.02
		12.76
<i>Maintenance of Transportation Plant and Equipment</i>		
Superintendence of plant and equipment.....		0.20
Maintenance of passenger coach bodies.....		0.04
Maintenance of passenger coach chassis.....		3.34
General repairs.....		2.01
		5.59
<i>Traffic</i>		
Superintendence and solicitation.....		0.28
Traffic supplies and expenses.....		0.02
Advertising.....		0.17
		0.47
<i>General Administration</i>		
Salaries of officers.....		0.47
Salaries of office clerks.....		0.65
Officers and general miscellaneous office clerks' expenses..		0.05
General office rent.....		0.12
Law expenses.....		0.11
Other administration supplies and expenses.....		0.44
		1.84
<i>Other General, Including Renewals and Replacements</i>		
Discounts on material and supplies credit.....		0.07
Renewals and replacements.....		3.92
Extraordinary renewals and replacements.....		0.56
Store labor and expenses.....		0.16
Injuries and damages.....		0.01
Insurance.....		1.49
Pensions and gratuities.....		0.01
Other general expenses.....		0.15
		6.23
Total operating expenses.....		26.89
Mileage.....		125.077

The reasons for developing the de luxe motor coach lines as we have done it in Pittsburgh were given in more detail than it is possible to give here, in a paper by the writer before the Central Electric Railway Association at its meeting last January. This was published in *ELECTRIC RAILWAY JOURNAL* for Feb. 12, 1927, page 298. In general, the lessons learned in our experience are that it is necessary to give the patrons a service which is sharply differentiated from ordinary street car service. Both in the design of the vehicles and in the matters of operation, such as routing, stops and schedule speeds, we have found this to be an essential to success.

De luxe bus service in the Pittsburgh district began with our acquiring from an independent operator a line joining the business and amusement centers of Pittsburgh and East Liberty. On Aug. 14, 1925, we originated a 5.7-mile route from downtown Pittsburgh to Squirrel Hill, a high-class residence district lying just beyond Schenley Park. For this service we installed 29

and 25-seat buses. On May 24, 1926, we originated a 6.6-mile route to Point Breeze, another fine residence district. The vehicles put on were 29-seaters.

Both the Squirrel Hill and Point Breeze routes make use of 2 miles of boulevard terminating in downtown Pittsburgh. The Squirrel Hill route also makes use of Schenley Park and, in general, is not near trolley territory. The Point Breeze route, after leaving the boulevard, is on streets with railway tracks for a good part of the way.

Beginning on Dec. 6, 1926, we changed Point Breeze from 29-seat buses to 19-seat coaches. These coaches have a wheelbase of only 210 in. compared with the 225-in. wheelbase of the others. The over-all length is also only 24½ ft. against the 28½ ft. length of the older vehicle. The reduction of over-all width from 90 in. to 81½ in. has been found of substantial value in avoiding accidents and in getting by other vehicles. Because of the better clearance conditions and smaller capacity, we were able to cut the running time from 38 minutes to 30 minutes.

The most recent line to be established is that to Mount Lebanon and Dormont, which was opened on March 21 of this year. This route also serves a fine residential section.

The East Liberty route has the advantage of a business and amusement center at each end. Application has been made to extend the Point Breeze line to the Wilkinsburg station of the Pennsylvania Railroad. This extension would produce some two-way travel on that line. The Squirrel Hill route has been rerouted advantageously near its suburban terminus in order to serve a larger population.

Mileage, running time and headways for the present routes are given in Table III at the bottom of page 514. The running times shown do not include layovers. The routes themselves are shown in the map on this page.



Service superior in comfort and speed to that of the street car is given at a higher fare by de luxe vehicles of the Pittsburgh Motor Coach Company

Details of the equipment owned by the Pittsburgh Motor Coach Company are given in Table IV on page 516. The latest equipments, which express the change to coaches of a more luxurious type and having smaller seating capacity, are the 19-seat Yellows.

EARNINGS, COSTS AND EXPANSION OF COACH SYSTEM

The increasing popularity of the pioneer routes and the addition of new ones promise a large increase in business for 1927. Comparison for the first half of 1926 with the first half of 1927 shows that traffic has increased from 531,152 revenue riders to 846,972, while the corresponding rise in net income has been from \$11,530 to \$30,110. Meanwhile the total traffic on the trolley system increased from 202,578,931 in the first half of 1926 to 203,143,147 in 1927. The net coach income remaining after meeting all cost of service charges rose from \$285 to \$121,970.



Half-hourly service between Newark, N. J., and Hackensack, N. J., is maintained by de luxe buses of the Public Service Transportation Company



At Washington, D. C., the Capitol Traction Company operates de luxe bus service between the center of the city and Chevy Chase

So far, the Pittsburgh Railways has been spared the burden of carrying extensive unprofitable bus operations which might have led to higher average fares than those quoted. Although the cash street car fare with cross-town transfer privilege is 10 cents, less than 6 per cent of the revenue comes from this class of riders. Both the 8½-cent token and weekly pass fares are very popular. In addition, a straight 5-cent fare obtains for short-haul rides on fourteen routes, on all the Washington city system and on part of the McKeesport routes. One route in McKeesport has a 3-cent ticket.

The only regular low fare bus service in Pittsburgh was an operation between Millvale and Pittsburgh via the 40th Street Bridge, begun on June 14, 1926, and abandoned on June 1, 1927. This was operated jointly by the Pittsburgh Railways and the Pittsburgh Motor Coach Company. It failed to meet expenses by \$400 to \$450 a month on a fare of 10 cents with transfer privilege to trolley. Outside of this, the only bus operations by the Pittsburgh Railways have been of emergency character. It operated a sixteen-seat bus for shuttle service during the reconstruction of the North Washing-

ton route, and a second bus seating 29 was used during the reconstruction of the Beltzhoover line.

Variation in earnings and expenses in different months of the year are shown in Table I. Winter, with 39.44 cents regular passenger revenue, is the best earning time, for then the autoist is less inclined to use his own machine. In June, with less shopping and more personal automobiling, 30.91 cents revenue came from regular passengers, but 2.70 cents came from special service. July, with school closing, vacations and exceptionally rainy weather, produced only 26.77 cents, but the operation was saved from loss through the rapid growth of chartered coach service to beaches and parks. This added 5.03 cents per mile, despite very poor weather. Table II shows the costs in detail for June, 1927. These figures may be regarded as typical.

In developing chartered coach and sightseeing service we employ a solicitor and enjoy the courtesy of paragraphs in the *Transit Guest*, the weekly "take-one" publication of the Pittsburgh Railways. Chartered coaches handled during 1926 totaled 436, while for eight months of 1927 the number run was 676.

These figures summarize briefly the experiences of the Pittsburgh Motor Coach Company. We have found the operation of de luxe buses on short headways at a 25-cent fare to be a paying proposition. The private automobile developed a desire for faster and more luxurious transportation than can possibly be given by a low-fare electric railway or bus service. That desire has become so set with many automobilists that they are willing to subject themselves to heavy expense and much annoyance rather than return to what they deem lower-grade transportation. By giving service of superior quality at a higher fare, however, we have succeeded in attracting this kind of patronage and built up a profitable business.

Table IV—Summary of Equipment Owned by the Pittsburgh Motor Coach Company

Type	Seats	Manufacture	Number
De luxe parlor	19	Yellow Coach	26
De luxe parlor	29	Safeway	2
De luxe parlor	16	White	1
Street car	29	Safeway	8
Street car	24	Mack	1
Street car	24	Pierce-Arrow	1
Street car	29	Fageol	2
Street car	24	Newport	1
Total			42

In taxicab operation the driver is the salesman



Taxicabs

*a Logical
Element in*

Complete Transportation Service

By J. A. QUEENEY

Vice-President Mitten Management, Inc.

“CO-ORDINATED TRANSPORTATION” is very much like the Constitution of the United States, so far as the ever-broadening interpretation of its meaning is concerned. Perhaps the first step in the co-ordination of urban transit was the elimination of competition between various street car lines, by joining them together into a single operating body. Next came the joining of rapid transit and surface lines. Then the bus appeared on the scene. Some sneered at it as a transitory fad. More far-sighted transportation men realized its possibilities and welcomed it into the fold. Last but not least the taxicab has been looked upon and found not unlovely.

Each of these steps has been considered by no small number of transportation men as a bold, even daring, maneuver. Each, in due course of time, has come to be accepted as a logical phase in the evolution of local transportation, though not without ranting by the demagogues and the necessity for careful educational work on the part of the transportation companies.

In April, 1926, after the approval of the city of Philadelphia and of the Pennsylvania Public Service Commission had been duly secured, the Yellow Cab Company of Philadelphia was purchased by the Philadelphia Rapid Transit Company for the sum of \$3,000,000. At that time this cab company was the largest in Philadelphia and the third largest in the world, having 1,100 cabs available for operation and an experienced personnel of 3,000.

The decision of any established transportation company whether or not to enter the taxicab field must depend upon a vast number of purely local conditions. It may be stated as a general premise that, except in very extraordinary circumstances, this type of operation should be undertaken only when there seems ample evidence that a substantial profit may be earned within a reasonably short period. As a profit-maker, the taxicab may be a very welcome little brother to the street car and bus, since it serves to bolster the earnings of the company and at the same time ceases to provide ruinous competition in the heavy-riding districts.

But some communities are “taxi-riding” and others are not. Generally speaking, the more cosmopolitan the city the more profitable the taxicab field may be expected to be, unless cut-throat competition has already cut the business to pieces. Taxi-riding is essentially a luxury, indulged in by the wealthy and those in moderate circumstances alike, but only where the public has become educated to the use of this individual transportation service. In communities where the street car and the bus still meet the needs of practically all elements of the population the early career of a taxicab enterprise may be full of pitfalls. Hence the railway man who contemplates entering the taxicab field should ask himself whether he or any one else can make a success of the business. The safest plan, albeit the one with the greatest initial cost, is to take over an established organization which has already proved itself a money maker.

In this way the prime requisite of an experienced and able operating personnel will be provided. The merchandising of taxi rides is like no other merchandising problem. Taxis are not like street cars and buses, operating on definite schedules and relied upon by multitudes of people for regular transportation. A prospective taxi-rider will be a customer only if his vehicle is right at hand or can be furnished instantly. Otherwise he will avail himself of some other means of transportation or will walk. A trained taxicab operator knows all of this and has a thousand little schemes up his sleeve to provide that "Johnny-on-the-spot" service.

When Mitten Management entered the taxicab field that was the procedure followed. The Yellow Cab Company of Philadelphia, incorporated several years before,

Furthermore, the public has learned by experience that it may rely upon a street railway of the proper sort to maintain definite schedules and to keep up a fixed standard of service, regardless of slumps in the transportation business. It would like to find a similar degree of reliability in the operating standards of other transportation media, such as the taxicabs. It most emphatically does expect this standard of service when a taxicab organization is taken over by the larger transportation company. But the advantages do not lie wholly with the public. Quite naturally the building up of public confidence in a given organization leads to public patronage of that particular medium. Undoubtedly the prestige of any cab company would be enhanced by linking up service of this kind with the organization



*Expedition handling of telephone calls is an important element in taxicab operation.
Telephone exchange of the Yellow Cab Company, Philadelphia*

had increased rapidly in size and had so perfected its service that at the time of the purchase it was acknowledged as being in the van of cab organizations in the United States. During the year 1925 its gross revenue had been \$5,000,000 and its net \$425,000. Hence the purchase price of \$3,000,000 was conceded to be a fair outlay for the property.

In taking over the property Mitten Management announced that no major changes in the operating personnel of the cab organization were contemplated. Such adjustments in practice as have been effected to date have been aimed solely toward more closely co-ordinating the cab service with the other public transportation mediums and taking advantage of such operating economies as might be put into effect.

In the main, it may be said that the public invariably stands to gain by a reduction in the number of more or less competing transportation agencies, with a corresponding centralization of responsibility, provided that the co-ordinated system which results is subject to the proper kind of regulation. The financial resources behind a great transportation system quite naturally inspire public confidence, since there can be no question as to the company's ability to make redress for injuries or fatalities.

which operates the balance of the community's transportation facilities.

Essentially, a taxicab company is a public utility in exactly the same way that a street car company or a bus organization is a utility. There have been many instances where this basic fact has been lost to sight by state and city regulatory bodies. It is true that a taxicab gives a preferential type of service, closely approximating that of the private automobile, but to the extent that it is available for the use of any member of the public and that it is subject to the same restrictions and many of the same taxes as are other public transportation media it is entitled to certain privileges as a public vehicle.

The established street railway, or co-ordinated system, which through long years has attained recognition as a public utility, already has an organization for fighting the legislative and financial battles which fall to its lot. It is equipped to take the taxicab organization under its wing and, in due course of time, secure for it the same consideration which is increasingly being accorded to the street car and bus. Where the railway has been fortunate in establishing a harmonious working relationship with the municipal government, the position of the cab company, as its subsidiary, would be immensely strengthened.

Without doubt there is tremendous value in fixing in the public mind the thought of one organization providing every desired type of public transportation. True, it furnishes the local quipsters with a fund of "digs" at the railway management. It provides inspiration for the newspaper cartoonist and columnist. But all this is excellent advertising and serves to root that picture of co-ordination ever more deeply in the public consciousness, provided that the established transportation company upholds its end of the bargain by making a convincing success of each new enterprise which it takes over.

The extent to which a taxicab organization may profit

panies and municipal governments alike is a panacea for the wasteful and traffic-clogging practice of "cruising" for fares. But this is easier said than done.

It is the uncertain nature of the taxi rider, his readiness to take the first cab in sight or to do without one entirely, unless he can be "snared" at the psychological moment, that renders the situation so difficult. Unquestionably, however, a solution of the problem may best be found by considering cab operation in relation to the other phases of public transportation, so that this may be looked to as a future advantage of co-ordinated operation.

While by far the bulk of the cab business is done by "pick-up" in the central districts, the telephone dis-



in reduced operating costs by consolidation with a street car and bus operating company depends entirely upon local conditions. If the transportation company's bus operations are not very large and its maintenance facilities are adequate, it is possible that the maintenance of a moderate cab fleet could be added, with minor adjustments in personnel and equipment. However, in the case of a large operation, such as the Yellow Cab Company of Philadelphia, this has not been possible.

Joint use of telephone dispatching facilities presents interesting possibilities, providing that the requirements of the street car, bus and cab operations do not conflict. Where the street car system possesses extra telephone cable privileges these might be taken over by the taxicab department, with a corresponding reduction in costs to both units. Established bureaus of the transportation company, such as engineering, accounting and public relations, may well be expanded to handle similar work for the cab organization, thereby eliminating duplication of effort.

Perhaps the thing most heartily desired by cab com-

Inset—Individual service is given by the taxicab while the car handles the mass movements. At right—Equipment used by the Yellow Cab Company of Philadelphia is housed in a garage by itself, separate from other automotive equipment of the P.R.T., its parent company

patching service is nevertheless an important element. Telephone calls for cabs will be made just to the extent to which speedy and unfailing response to those calls is given. The Yellow Cab organization in Philadelphia has built up this phase of its business enormously during the past few years. A central telephone dis-

patching board, with a number of operators, is provided, and from this point calls are relayed to cab drivers at the more than 200 cab stands established in various sections of the city. Hence the "magic carpet" is at the door within a few moments after the telephone request has been made. The cab driver-salesmen have been thoroughly impressed with the point that, once having accepted a telephone assignment, that call must be gone through with, regardless of what "pick-up" jobs may appear on the streets. As a result it is only rarely that patrons complain of failure to respond to their order for cabs.

RESULTS FROM CAB OPERATION IN PHILADELPHIA

P. R. T. operated the Yellow Cab Company for eight months during 1926. Net earnings for this period amounted to \$198,338, being at the rate of approximately

\$300,000 per annum. The gross passenger revenue of the cab organization for the calendar year 1926 was \$6,437,969. Last year was a good one for cab operation in Philadelphia, partially due to the presence of the Sesqui-Centennial Exposition in the city. Earnings thus far in the current year have not come up to those for a corresponding period in 1926. During the first six months of 1927 the gross passenger revenue from our cab operation amounted to \$2,980,674. Something of a temporary industrial depression has manifested itself locally during the past few months and of course this has had a distinct influence on taxicab riding.

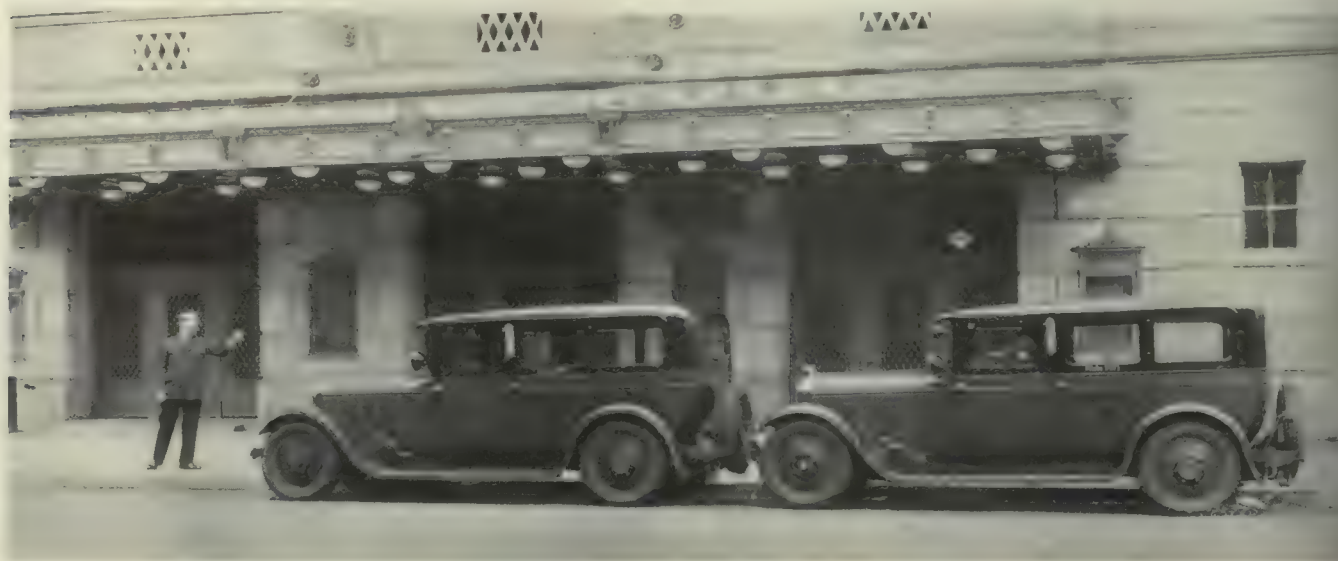
CABS OPERATED BY RAILWAY IN MINNEAPOLIS

To date only one other established transportation system has undertaken the co-ordination of the taxicabs in the community which it serves. That company is

cab venture by entering into a rate war with independent operators unless he is literally forced into it by the direst of tactics on the part of his competitors. Cab rates may easily be lowered, but can be raised only over a storm of protest which may have far-reaching consequences.

Hence it is eminently desirable to establish the taxicab venture upon a sound earning basis at the outset and to maintain it at that point through thick and thin. If reasonable rates are backed up by a reputation for safety and courtesy and for financial responsibility, together with comfortable and well-maintained equipment, it will be a combination hard to beat.

In most cities there have been efforts on the part of hotels, theaters and similar institutions to reserve the street space in front of their respective places of business and to lease that space as taxi stands to the highest bidder. Without question this is a pernicious practice.



*Stand of the Yellow Cab Corporation of Minnesota at the Minneapolis Auditorium.
This company is controlled by the Twin City Rapid Transit Company*

the Twin City Rapid Transit Company, in Minneapolis and St. Paul. Other railway executives are delving into the possibilities of such a step, judging by the requests for information on the Philadelphia operation which are received. The question is frequently asked, "Is the taxicab business so much a cut-throat proposition that it is unsuitable for a responsible agency like an existing transportation company, or is it possible to eliminate cut-throat methods, either through regulation or by rendering service of a character so high that competitors cannot live?"

Answering the second part of the question first, it may be said that the so-called cut-throat methods are frowned upon by reputable independent operators. Where they exist, however, they cannot be eliminated by sheer quality of service, since, as has been pointed out before, a prospective cab patron is more interested in securing a vehicle at the moment desired than he is in waiting for a more comfortable and reliable cab.

Proper regulation of all cab operations in a given community by the police authorities and by the state public service commission will go a long way toward eliminating some of the most objectionable features of cut-throat competition. The established transportation company cannot afford to prejudice the success of its

The streets are public property and are no more subject to the control of the abutting property owners than would be the sidewalks in a question as to who should or should not be allowed to walk thereon.

The Yellow Cab Company of Philadelphia has never entered into such arrangements for exclusive privileges on public property. It is our belief that taxi stands should be provided at all points where patrons are apt to congregate and that such stands should be open to all legitimate cab organizations. The reservation of street space for cabs is justified by the public service which they render, but there should be no discrimination. Concessions on private property, near points of concentration, is another matter entirely. They are justified only if sufficient patronage is procurable at those points.

Unquestionably the office building of tomorrow will make provision for cab stands, so that its tenants may be afforded convenient cab service. The railroads have universally recognized the importance of making such provisions, stores in some of the larger cities have adopted the same plan and there is every reason to believe that the modern office structure will be planned along similar lines. Luxuries though cabs may seem to be, they are patronized almost as necessities by an ever-growing number of people.



Broad Street, Newark, N. J., at Military Park, a heavy traffic point on the lines of the Public Service Transportation Company, the largest operator of buses in America

Street Car Type Bus

Meets a Real Transportation Need

By JOHN A. MILLER, JR.

Associate Editor ELECTRIC RAILWAY JOURNAL

BROADLY speaking, there are four kinds of service for which the street car type bus is well adapted. First, it may be utilized advantageously to serve districts not already served by rail lines and where the traffic is too thin to justify an extension of the railway. Second, it may be used to supplement car service on heavy traffic lines, either by furnishing local service while the cars run express or by giving express service while the cars do the local business. Third, it may be used to replace rail service where a large expenditure would be required to rehabilitate a light traffic line. Fourth, it may be used to replace rail service where the latter is not conveniently routed, or where operation is hampered by single track or other unfavorable conditions.

In making extensions into newly developed and sparsely settled districts beyond the limits of the railway system, the great advantage of the bus over the car is the smaller original investment required. It is customary in a situation of this kind to operate the bus service merely to feed the nearest rail line and to transfer passengers from one vehicle to the other where their routes meet. This practice is followed by the Boston Elevated Railway, the Winnipeg Electric Company and a number of other electric railways. Sometimes, however, the bus routes serving outlying districts have been ex-

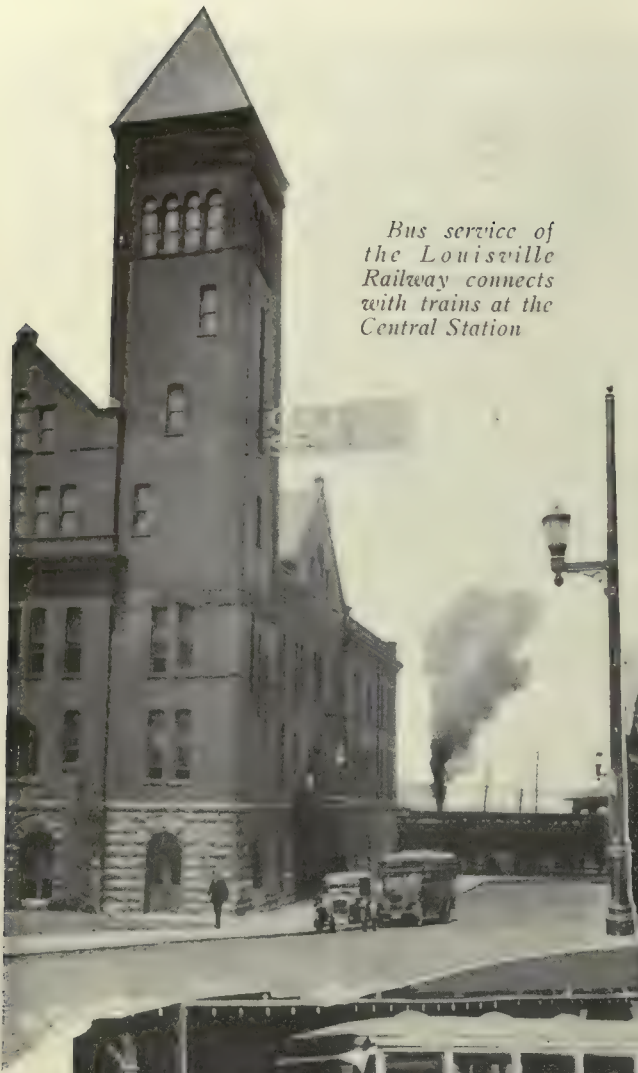
tended into the center of the city. From the standpoint of the convenience of the passenger such an arrangement has advantages, but the number of buses required is larger, with a consequently larger capital outlay. Moreover, the cost of operation is increased in proportion to the increase in vehicle mileage and a certain amount of duplication of service is likely to result from this process. If the nearest available car line has sufficient capacity to accommodate the passengers from the bus line, it probably is better to confine the bus operation to purely feeder service rather than to establish it as an independent trunk line.

Serving a district lying between two rail lines is a somewhat different problem. When railway routes spread out fanwise from the center of the city, areas of considerable size may exist in the suburbs at some distance from the nearest car line. These districts may or may not be of recent development. In any event the coming of the automobile has changed the public point of view concerning transportation, and people today are unwilling to walk as far to reach a car line as they formerly did. Hence some kind of convenient service is needed. This may be given either by a crosstown feeder bus route with transfer of passengers to an adjacent rail line, or by through bus service to the downtown district. Sometimes it is

Buses Operated by Electric Railways Supplement the Car Service in Many Cities

*Bus service of
the Louisville
Railway connects
with trains at the
Central Station*

*Below—In Albany, N. Y., bus service
is operated by the Capitol District
Transportation Company, a subsidiary
of the United Traction Company*



*At left—Co-ordinated rail
and bus service of the N. O.
P. & L. Company at Akron*

*Below—City terminus of bus lines
operated by the Connecticut Company
at New Haven*



possible to combine several crosstown feeder bus services into a route of considerable length. Usually, however, the most satisfactory way to serve a district lying between rail lines is by furnishing through bus service to the center of the city. An example of this is the operation of the Connecticut Company at New Haven.

The rate of fare on a bus route operated as an extension to an electric railway is a matter of paramount importance. In general, new bus routes should pay the cost of their operation. The only alternative would be to absorb the loss in the earnings of the whole system. While it is true that bus extensions cannot be considered entirely independently of the general transportation facilities, and there are numerous instances of lines, both bus and car, that do not earn their cost of operation, the establishment of new lines of this character should be undertaken cautiously. Under ordinary circumstances, it is better to defer the establishment of feeder bus service until the traffic is sufficient to make the undertaking

routes of the Public Service transportation system in New Jersey. The bus, being a smaller unit than the car, makes fewer stops. Moreover, it has greater flexibility in traffic and is somewhat less subject to delays. For these reasons the bus ordinarily is somewhat better suited than the car to render express service.

Whether or not this should be done at street car fares depends on a number of factors. In short haul railroad and in rapid transit operation, no distinction is made between the express passenger and the local passenger as regards the rate of fare. If the bus is simply acting as a supplement to the rail system, giving the same quality of service, the fare should be the same. On the other hand, if better equipment is used for express bus service, the so-called semi-de luxe type, it is reasonable to charge a fare higher than that on the cars.

Street car type bus service sometimes is used to replace electric railway service on light traffic lines. The extent to which such substitution has gone, however, is



At Winnipeg, Manitoba, buses are used in crosstown feeder service connecting with car lines

financial success. The establishment of any considerable number of losing lines might easily force an increase in the general fare level.

Use of buses to supplement car service on heavy traffic lines has attractive possibilities. This can be done in either of two ways. The cars can be operated express from the center of the city to some point in the suburbs while the buses carry the local traffic. Such an arrangement has been in effect for some years at Providence, R. I., and has worked out well. A similar plan is being tried at Detroit. Attractive savings can often be made by a combination of express car and local bus operation. It is difficult, however, to operate satisfactory express service with cars, unless the street is sufficiently wide so that they are comparatively free from vehicular interference. Such freedom from interference may be secured by operating the cars on a private right-of-way in the center of the street, as is done to some extent in Boston, Baltimore, and a number of Southern cities.

A plan which has been more widely adopted is to have the cars do the local business and have the buses give express service. This is being done on a number of

much exaggerated in the public mind. Because this has been done successfully in a limited number of instances, the layman is apt to have the idea that the bus is going to replace the car on all light traffic routes and perhaps on the heavily traveled routes also. As a matter of fact, comparatively little railway trackage has been abandoned in favor of buses. The electric railway industry as a whole in the United States and Canada has replaced rail service by bus service on only about 5 per cent of its trackage. This represents but an insignificant part of the present bus operation of the railways.

Substitution of bus service in place of rail service usually is made because of the existence of conditions unfavorable to continued railway operation. It may be that the track has been allowed to deteriorate until extensive rehabilitation is necessary, or it may be that a big paving program is in prospect, either of which would cost the company large sums that it could ill afford to spend on a light traffic line. To avoid such expenditures the management may decide to substitute buses in place of cars. In many instances this plan has worked well.

When this is done there arises a serious financial prob-

lem. Under ordinary circumstances the railway is not likely to have accumulated sufficient depreciation and renewal reserve against any given piece of track, to permit writing it off the books when it is desired to substitute bus service in place of car service. For this the management cannot be blamed because the accumulation of reserve for depreciation and renewal is regulated by the state utility commissions. If the track to be abandoned is only a small part of a large system it can be written off from the general reserve fund, but if, as sometimes occurs, this track represents a fairly large part of a small system, this procedure is impossible, and the management is then faced with the problem of paying interest on the original investment out of the bus earnings. Since substitutions of this kind almost always are on light traffic lines this is a difficult matter. The ultimate solution appears to lie in a more liberal attitude on the part of regulatory bodies to permit earning and setting aside larger amounts for depreciation and renewals.

It frequently happens, also, that buses are substituted in place of cars when it is desired to make a change in routing, or when the cars are operated over single track with badly located turnouts. A number of substitutions of this kind have been made with marked success on railway systems. When the tracks were originally laid it was not possible to secure permission to follow the desired route all the way, and rather than delay the construction of the line a roundabout route was adopted. While this did well enough in the early days, it is no longer satisfactory because of the increased emphasis which the public places on speed in transportation. In other instances, the character of the neighborhood has changed somewhat since the original electric railway tracks were laid, and it is now found more advantageous to follow an adjacent street. Substitution of buses in place of cars permits this to be done with a minimum of difficulty and expense.

On single-track lines the spacing of turnouts determines the headway that can be operated. Often it is found desirable to change the headways from those used when the line was first built. This cannot be done unless the spacing of the turnouts is suitable for the desired headway. For example, to operate a six-minute headway with turnouts laid out for a $7\frac{1}{2}$ -minute headway, probably would cause intolerable delays. Under these circumstances the solution of the problem may be found in the substitution of bus service in place of railway service.

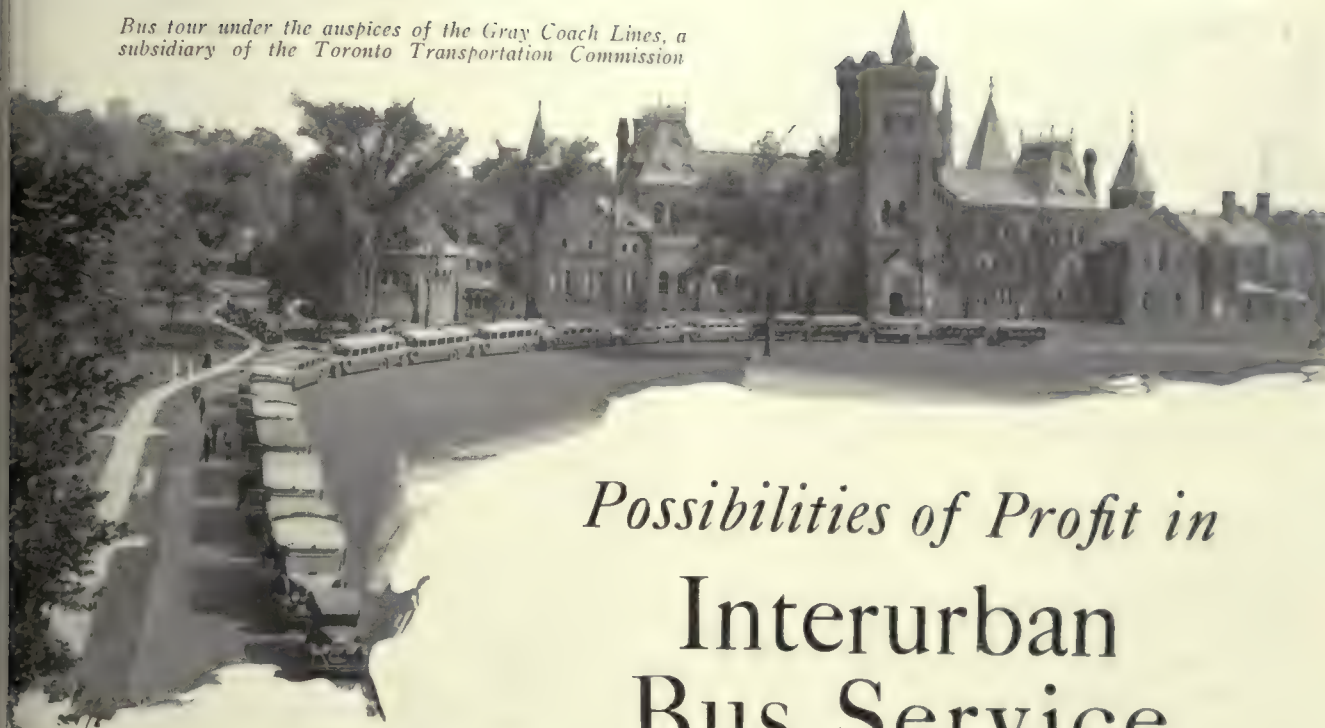
A complication often encountered in fitting the bus into its proper place in the general transportation scheme arises from the purchase by the railway of existing bus routes operated by independents. This has been done extensively by Public Service in New Jersey, where many routes were laid out with no attempt to prevent duplication of facilities. In fact, the principal idea of the original bus operators was to divert to themselves part of the traffic from some route already in existence, rather than develop new traffic. No real need exists for such duplication of service. Nevertheless, a certain part of the public finds it convenient, and has consistently opposed any change in routing. It is evident, however, that a substantial improvement could be made by shifting the buses to streets on which no cars are operated. This was done with marked success on one route early this year. The result was a substantial increase in the combined traffic on cars and buses serving the territory, showing conclusively that the convenience of the public as a whole was greatly enhanced thereby.

Used in its proper place, the street car type bus is a valuable adjunct to the electric railway. Its greatest usefulness, however, is not in merely duplicating rail service, nor in general is to be found in supplanting it, but rather in supplementing it on heavy traffic routes and in districts not otherwise satisfactorily served.



Handling traffic by bus over the Delaware River Bridge connecting Camden and Philadelphia

Bus tour under the auspices of the Gray Coach Lines, a subsidiary of the Toronto Transportation Commission



Possibilities of Profit in **Interurban Bus Service**

By J. L. SMITH

*General Superintendent Gray Coach Lines and
Superintendent Motor Coach Department
Toronto Transportation Commission*

ONLY in recent years has interurban bus operation been developed on a large scale, but a discerning public has made its voice heard and long distances may now be traveled by means of the modern parlor coach. In a number of instances this service is given by electric railway companies or their subsidiaries. In Canada, as yet, bus transportation is in its infancy and, with the exception of a few companies, operation is confined to city routes or short suburban feeders to the main city system. One of the principal difficulties encountered in the Northern states and Canada, with which the Southern states do not have to cope, is the severe winter weather and the accompanying problems of keeping the services operating. The solution of these problems should receive the most careful consideration of any company that proposes to inaugurate an interurban coach line because, once started, no route should be abandoned for a single day. Besides the loss in revenue that occurs if operation is suspended there is the more severe loss of prestige, which may prove disastrous to the whole undertaking. It is a matter of satisfaction to the management of the Toronto Transportation Commission that last winter not one single trip was lost between Toronto and Niagara Falls, a distance of 90 miles, the longest interurban route now operated by the Gray Coach Lines, Ltd., its bus subsidiary.

In 1921 four solid-tired city-type buses were all the automotive passenger vehicles owned by this company. Three years ago this had grown to a fleet of twenty. Now, in 1927, more than 120 modern buses are operated some 90,000 miles per week, or nearly $3\frac{1}{2}$ times around the world. Four schedule trips each way per day are operated between Toronto and Niagara Falls, with a return trip mileage of 166 miles. Twenty-five trips per day each way are operated on what is known as the Lake Shore Highway between Toronto and Hamilton, a 43-mile run. These, together with three round trips per day between Toronto and Brantford, a distance of 70 miles,

and three between Toronto and Cookstown, a distance of 55 miles, account for a considerable amount of this large mileage. Each week shows a steady increase over the preceding one.

No opportunity is neglected to increase business in every possible way. Arrangements have been made with the International Railway to make direct connection at Niagara Falls with Buffalo. Connections are made also at Niagara Falls with coaches operated by the Buffalo, Niagara & Toronto Tours. Coaches of the latter, in turn, make connection with coaches operated by the Buffalo & Erie Coach Company, the Cleveland & Conneaut Bus Company, and the Western New York Motor Coach Lines. Under this arrangement it is possible to make connection between Toronto, Buffalo, N. Y.; Erie, Pa., and Cleveland.

In addition to these services a Circle Tour has been arranged with the Canadian National Railways. This tour permits a passenger to travel one way by coach and one way by boat to Niagara Falls. Through tickets covering these services are sold at all Gray Lines offices. Time-tables are distributed at all offices, outlining the services with the direct connections that it is possible to make. Although started only a short time ago, considerable business has been worked up and it is felt that with additional advertising and the co-operation of agents of the Gray Lines, as well as those of connecting companies, it will be possible to establish a substantial traffic.

Interurban bus operators new in the enterprise may wonder what the prospects are for the future. With the rapid developments which are taking place this is somewhat difficult to forecast. It should be safe to say, how-



Interurban buses supplement the rail service of the Boston-Worcester Street Railway

ever, that this form of travel is only in its infancy, and its development will depend, to a large degree, on the quality of service given.

The question of road equipment is one of paramount importance. Seats must be as comfortable as possible and have fairly high backs. The air cushion type has proved eminently satisfactory, but if made up in two pieces the upper piece should be held in such a manner that it will not slip forward when the passenger reclines or stretches out. Windows must be so constructed as to provide easy movement. Anti-rattlers are necessary on all interurban equipment. Most companies find that smoking must be permitted on long trips, and proper receptacles must be provided for ashes and matches. Rules regarding smoking must be enforced by the drivers: firmly, but in a tactful way.

As interurban passengers will be likely to have baggage to carry, this problem must be given full consideration if the system is to run smoothly. The luggage rack on the roof should have a waterproof tarpaulin covering, and straps should be supplied to hold the bags securely in place. A system of checking should be in force. Tires are an important item in operation, and the plan of carrying two spares on every coach has proved very successful. When signs of wear are noticed tires are removed and placed on city lines, where a much shorter headway between coaches and nearness to the garage eliminate the trouble that would be experienced by blowouts on the highways. In this way a tire may be run to its ultimate mileage with the minimum of delays to the service or inconvenience to the riding public. Lights, heating arrangement, ventilation, etc., must be of the very best,

and it is hardly necessary to add that the mechanical condition of the coach must be as nearly perfect as the garage forces can make it.

For the convenience of those along the route wishing to board after dark, all coaches of the Gray Lines are equipped with large green lights attached to the roof. The light can be seen at a considerable distance, and by reason of its height it is visible over the top of other traffic. An emblem recently has been designed and placed on all Gray Line coaches. This has a green disk representing the green light on the coaches, in the center of a pair of wings above a shield. Illuminated signs of the insignia, with the green disk also illuminated, are being constructed and will be placed at all important terminals. Metal signs of the design are being placed at other stopping points, and arrangements are now being made to place signs at all stops on the various highways over which this company operates. Drivers are instructed to request passengers to "look for the green light." Aside from the advertising value, this arrangement has been of considerable convenience to the traveling public.

Perhaps no item on a long-distance run is more important than the selection of drivers. Besides being directly responsible for the safety of the passengers, they are the greatest selling force. A clean-cut, courteous and cheerful operator will bring more patrons to the coaches than hundreds of dollars worth of advertising. Obviously, drivers should be selected with the greatest care and, if possible, only men of large stature taken. They should be trained thoroughly on the route over which they are to run and impressed by every means with the necessity of not only looking for passengers at the various stopping points but of expecting them. When thoroughly conversant with the road, the agencies, and the various municipal laws affecting the operation along the route, then, and not till then, should they be given charge of coaches.

It costs a considerable sum to thus train a driver and it therefore follows that he should be kept on the chosen route as long as possible. Much is expected of the operating men and, in return, in order to keep the morale at the highest point, every facility must be given them to make their task as easy and as pleasant as possible. The following instance is cited as an example of what the

All interurban coaches stop at the Terrace, midway between Toronto and Niagara Falls, where comfort stations are provided and light refreshments may be purchased



Gray Coach Lines do in this respect. During the two weeks period of the Canadian National Exhibition a special service, in addition to the regular service, is operated on all interurban routes. In one city alone, Hamilton, Ont., twenty extra drivers are required to handle the special service out of that city. A large office has been fitted up with beds to form the dormitory for these men. Wash rooms and shower baths have been engaged in the city's leading hotel, and every chance given the drivers to report for work in the morning as if they were coming from their own homes.

The local agent is a highly important advertising force. The company with which the writer is associated has gone to considerable length to establish in each municipality of any size whatever a competent and willing agent. Often he is the owner of the general store

passengers are probably newcomers to the district and will not know their destination by sight. Ladies should be assisted in alighting from the coach and their baggage taken from the racks and handed to them. If tickets are used, they should be collected in a courteous manner and any information regarding the return trip accurately given. If a connection is being made with another coach line, full particulars of their operation should be known to the driver and their schedules outlined to the passenger.

When it is remembered that interurban coaches probably operate on a long headway, it is easily seen that a comfortable and convenient waiting room must be supplied at the terminals and, if possible, at important stations along the routes. The Toronto terminal of the Gray Coach Lines is provided with ticket counter, the tables, easy chairs and decorations, such as plants, etc.



Interurban service is operated by the Penn-Ohio Coach Lines between Youngstown, Cleveland, and Ohio

or, perhaps, the druggist; in any event, he is some one who knows the people and is in constant touch with them. After all, a little personal contact is worth a great deal of spasmodic advertising, and it is the experience of this company that the appointment of such an agent always increases the sales and the coach riding habit in that locality. A little authority granted to them will also help things, and some agents of this company who are not on the payroll are allowed to put occasional advertisements in their own local press and to check the service to a certain degree. This results in their taking an active interest in the operation. The relationship with agents should be kept friendly, and frequent visits from one of the officials and the discussion with them will do a great deal to help along this feeling.

In interurban coach operation as stopping points are reached the name of the place should be announced distinctly, as it must be borne in mind that many of the

that make the place inviting to the traveler and a silent salesman for the company. Telephones, information booths, and proper toilet facilities for men and women are necessary. In building a bus terminal it should be borne in mind also that the architect may, in the exterior design, build a permanent advertisement of untold value.

Along the routes comfort stations must be provided where the coach will stop for a few minutes. Such a station on the Toronto-Niagara Highway is shown in an accompanying illustration. Here the passenger has access to wash rooms, and light refreshments may be obtained.

Actual operation along the route will be influenced greatly by local conditions and topography, but the first and last thought must be safety. To a large degree this can be secured by the driving personnel, to which reference has previously been made. The coach itself, however, must be in the very best possible condition.

Meeting the Demands for Better Transportation in Europe

By H. W. BLAKE

Senior Editor ELECTRIC RAILWAY JOURNAL

MANAGERS of electric railway, bus and rapid transit lines in Europe are keenly alive to the need of meeting the demand for good transportation in their several communities. Local transportation has been given in many European capitals for a longer time than here, but the development has been along somewhat different lines. Some of the methods employed appear to give better results than those followed in America. Others, while perhaps suited to European conditions, would not be adaptable here.

Roughly, it may be said that the fields of street car, bus and rapid transit service are the same as in America, though the situation varies widely in the different cities. Thus, in London, where street cars are not permitted to enter the principal office and retail business district north of the Thames, there has been great bus development. In Berlin, on the other hand, of the three facilities the street railways in 1926 carried about 75 per cent of the passengers, the rapid transit lines 15 per cent and the buses only 10 per cent. In Paris the proportions are about 45 per cent, 21 per cent and 34 per cent and in Hamburg 72 per cent, 27 per cent and 1 per cent. In the larger cities in Italy—Rome, Naples and Milan—bus operation is on a small scale compared with street railway operation and there are no real subways, although in Naples an extension of the government main line railroads passes under the city and does a little local business. Generally speaking, in all of these cities the street railways handle the bulk of the traffic. Where the bus and street railway lines are under the same management, the railway is considered more economical than the bus for mass transportation. Where there is a difference in fare, that on the bus is higher.

FEW CHANGES IN STREET CAR DESIGN

Street railway car body design in Europe has not gone through as many changes during the past twenty years as it has in America. One reason for this may be that most of the bodies in Europe are made in the country in which they are used, and each country has only a limited demand. Compared with the United States, the number of new cars built each year is much smaller. Then, too, a great deal of attention is paid in Europe to

good body maintenance, especially painting. There is a corresponding tendency not to scrap cars until they are so injured in an accident as to be practically useless.

On the Continent of Europe the single-deck car is almost the only one seen. On account of the narrow streets and sharp curves, vehicles for city service have to be kept narrow, and are rarely more than 7 ft. wide over all, and often less. As cross-seats are generally

used, this means that when two passengers are seated on one side of the aisle there is room for only one passenger on the other side. Reversible seats are occasionally seen, but the stationary seats in which half of the passengers face forward and the other half backward are more common. These seats are usually arranged in groups of two, facing each other, a plan similar to that in the standard European railroad coach, to which the public is accustomed. While some of the street railway seats are upholstered, slat

seats are common, especially in southern France and Italy. Open cross-bench cars are occasionally seen, but they are going out of use.

In France and Belgium, the division of the interior of cars for the accommodation of both first and second-class passengers is common. The two compartments are not usually separated by a bulkhead or door, but often



Many surface car trains are run in Berlin. Commercial advertising is often painted on the sides of the cars



Cars in Hamburg are well supplied with route signs

by a bulkhead only, or simply a stanchion on each side of the aisle to indicate the dividing line. The principal difference between the two compartments is that the seats in the first-class compartments usually are upholstered in plush and those in the second-class compartments are either not upholstered or covered in rattan or tapestry of a color different from that in the first class. Where center-entrance cars are used, one end is for first-class and the other for second-class passengers.

Most of the cars are double ended with end entrance and exit, though lately there is a tendency, as exemplified by the latest cars in Paris and Berlin, toward center entrances. With end entrances some companies make an effort to require passengers to board at the rear, though as hand collection of fares by the conductor passing through the car is common, the method of entrance is not important. On some lines the front platform is reserved for smokers. Where two classes of fares are collected, passengers standing on the platform pay only second-class fare, hence there is a tendency for both platforms to be crowded, even when there are empty seats in the first-class compartment inside. This means that extra support for the ends is necessary.

The principle of the closed platform for safety's sake is almost unknown on the surface and bus lines of Europe, and on most of the rapid transit lines the door arrangement seems much cruder than that used in this country. When a surface car or bus approaches a stopping point, passengers expecting to leave there prepare to disembark and often do so before the car has come to rest. The same is true of passengers boarding cars and buses after they have left the stopping point. While there are sometimes notices in the cars that passengers are not allowed to board or leave the car or bus while it is in motion, it seems to be customary that these notices are disregarded.

Most surface cars in Europe have platform doors or



The latest type of Dortmund city car has Cardan drive

gates which are kept closed on the side away from the curb but they are kept open on the loading side to facilitate the rapid entrance and exit of passengers. Some-

times, as in Paris, the door opening on the curb side of the car is protected by a slight barrier, such as a chain, to prevent passengers from being thrown from the car while it is in motion, but it is attached to the side posts only by snap links and can be taken off by a passenger as the car approaches a stop. The only surface cars which the writer remembers seeing in Europe equipped with platform doors or gates operated by the motorman were some one-man cars in Amsterdam, a few trial cars recently received by the Berlin Sur-

face Lines, and one double-deck car now on trial service on the lines of the London County Council Tramways.

DOUBLE-DECK CARS POPULAR IN ENGLAND

Double-deck cars are very popular in Great Britain, but are not used to any extent on the Continent. The only single-deck cars operated in London are on lines where there are overhead obstructions which prevent the use of double deckers. Modern British practice favors the closed double deck.

Cars of the London County Council are built 7 ft. 2 in. wide on the upper deck but only 6 ft. 10 in. on the lower deck, the difference being to allow space for a man to stand between tracks when cars are passing each other. The upper decks on these cars can accommodate, therefore, four passengers on transverse seats, but there is not room for that number on the lower deck. In consequence, the lower decks on most of the L.C.C. cars in the past have been equipped with longitudinal seats, but realizing that cross seats are more popular, the management has been changing to cross seats. This meant not only a loss of five seats on the lower deck but a reduction in the carrying capacity of the car by more than five, because standees are permitted on the lower deck only up to one-third of the number of seats on that deck, and



Milan is encouraging the use of the rear platform for entrance and the front platform for exit. This shows the front car of a two-car train



This car in Lugano, Switzerland, is painted a baby blue



Double-deck cars are the standard in London

none are allowed on the platforms or upper deck. The County Council changed 100 of its cars last year to this new arrangement, and expects to change 250 more during 1927. It is fitting all of the seats of the lower deck with cushions and taking the opportunity while these cars are going through the shops to provide better inside and outside lighting and other improvements. All cars so changed over on the London County Council lines are being painted red instead of chocolate for the side panels and dash to help the prospective passenger to distinguish them.

SINGLE TRUCKS GENERAL ON THE CONTINENT

Outside of Great Britain, single-truck surface cars predominate in city service. In a few of the larger cities, like Paris and Berlin, there are some double-truck cars, but for the most part they are old equipment and no more are being ordered. Where double trucks are used the maximum traction type usually is employed.

One reason for the extensive use of single trucks is that the narrow streets require the use of short cars. Where more capacity per unit is required, two-car trains are used, usually a motor car and a trailer. To prevent the grinding of the wheels on short radius curves, a good deal of attention has been given to radial trucks, but their use does not seem to be increasing.

On the London double-deck cars, maximum traction trucks are the rule, though in Great Britain outside of England there are still a good many single-truck cars. Even in London, four-wheel cars are used on the London County Council Tramways on routes where the grades are steep. For such service, however, the L.C.C. is now



Loading a Milan bus at Cathedral Square

designing an eight-wheel, four-motor car to have carrying capacity equal to its maximum traction cars. This new car will use 26-in. wheels.

Efforts are being made in a few cities to test the Cardan drive. Paris leads with 475 cars equipped with this form of drive. Berlin comes next with 20 or 30. There are perhaps 40 more cars in Europe with this form of drive, most of these latter being of what is known as the Albrecht pattern, named from the designer, Mr. Albrecht, general manager of the Dortmund Street Railway. The manufacturer for the Albrecht drive is the Krupp Company of Essen. While the users of these equipments speak well of them, they should still be considered as in the experimental stage.

Roller and ball bearings for both motor armatures and car journals are used more extensively in Europe than in this country. The Berlin surface lines have used roller bearings on all new equipment for three years and during this time have added more than 1,000 cars to their rolling stock. Many other companies are making them standard equipment on all new cars, and the users of the Cardan drive system say generally that roller bearings are essential in its operation.

CAREFUL ATTENTION PAID TO PAINTING

A feature of all European cars, but especially those on the Continent, is the outside finish. On the surface cars light colors predominate, and white is not unusual. Another popular color is a baby blue. These colors are used not only because of the pleasing effect which they produce but also because the cars can thereby be seen a long distance away. This is both a safety measure and of help to waiting passengers. Varnish is used lavishly, so that the exteriors of the cars in many cities really have the so-called "piano finish." Subway cars in Europe do not run to the same light colors, but their exterior finish is well maintained. Instead of paint, Paris is using a vitreous enamel on the side panels of its cars. Hamburg has two cars finished in this way.

Advertising on cars, both on surface cars and on rapid transit cars, is carried far beyond that which is considered good taste and even effective in America. It is often placed on the windows in the form of etching or small transparencies, on the backs of seats, on the step risers, on the hand straps, on the outside car panels, on the trolley poles and even on the trucks.

WOOD PREDOMINATES IN SURFACE-CAR BODY CONSTRUCTION

Outside of a few of the latest cars in Great Britain and Germany, most of the street railway rolling stock in western Europe is of wood, occasionally with steel girders for side sills. Aluminum, however, is used extensively for such parts as dashes and side panels to reduce car weight. The reason given for the general use of wood is that the number of cars ordered by any one railway at one time usually is so small that templates necessary for the construction of steel cars would be too expensive. Nevertheless, efforts are being made to keep down the weight, although with only three seats across the car, the weight per seated passenger is not particularly low. Thus in the latest "light" car of the Paris surface lines, which is 37 ft. 1 in. over all, the weight of the car empty is 28,160 lb. As this car seats 30 passengers the weight per passenger seat is 939 lb.

Berlin's latest cars are of steel, and there are a number of steel interurban cars in Germany and some in other countries. While investigation has been made of

the possibility of using light metals in both car and bus construction, more has been accomplished along this line in rapid transit car body design. The Berlin rapid transit lines are building two cars of light metal and expect a saving of from 6 to 7 tons per car. At present the standard Berlin rapid transit trailer weighs 24 tons and the motor car 32 tons.

Although no special study has been made of means for reducing noise on surface cars in Europe, they are noticeably more quiet than the average car in the United States. The reasons for this and an account of the extended noise reduction experiments of the London Underground Electric Railways Company, with comments on other features of rapid transit car design, will be given in a later article.

BUS BODY CONSTRUCTION AND DESIGN

The statement in regard to the use of wood and steel in surface car bodies, made above, applies generally to bus bodies also. The largest user of steel bus bodies is Hamburg, the last twenty bodies added to the equipment there being of steel. Practically all of the bus bodies in Berlin, Paris and London are of wood.

Nearly all the Berlin and London buses are double deck. Of the 4,000 buses owned by the London General Omnibus Company only 180 are single deck and these are on routes where overhead obstructions prevent the employment of double deckers, and a few that run on suburban routes. The Berlin bus company also has a few single-deck buses for special service, but its standard city bus is double deck. Both in London and Berlin the upper deck is inclosed in the latest type of buses. In Hamburg and Paris only single-deck buses are used.

Paris is the only one of the cities mentioned which has two classes of bus fares, first and second. All buses in city service in Paris reserve the front end of the bus, usually sixteen seats on a 38-passenger bus, for first-class fares. For the 22 passengers who ride second-class there is room for twelve seated and ten standing passengers.

Cross-seats are the rule in all of the cities mentioned. In Berlin the upper deck arrangement is unusual, with a side aisle and benches holding three to four passengers each. This plan was adopted to allow a higher entrance to the lower deck, which has a center aisle. It has permitted also a reduction of the over-all height of the bus from 13 ft. 1½ in. to 12 ft. 10½ in., in a later low-floor design. The carrying capacity of the Berlin double-deck bus is 54, allowing three to a seat for the seven seats on the upper deck and 24 seated and nine standing on the



Naples bus at its Public Gardens terminal

lower deck. The over-all width is 6 ft. 11 in. The seats are upholstered in moquette.

The entrance to the Paris bus is unusual in that it faces to the rear, an arrangement that the management feels has safety features. The entrances in the other cities mentioned are at the side of the rear platform. All the properties are developing low-floor buses in which the rear platform is the first step and there is a riser from this platform to the floor of the bus. Fifty of these have been built for Paris. In nearly all of the cities, the driver's seat is alongside the engine or over it, to save over-all length.

As with street cars, extended use is made of aluminum in bus construction in Europe, particularly for side panels and dashes. Studies in the use of other light metals, such as laural and elektron for body construction, have been made by the Berlin General Omnibus Company, which is using elektron now to a considerable extent in parts of the chassis, as well as for pistons, gear housing and wheels, with considerable saving in weight.

Solid tires are used almost exclusively in city service, but most of the companies have some buses fitted with pneumatics for suburban and interurban service. Hamburg leads with proportion of six-wheel buses owned, 85 of its 90 buses being of that type, and all of them being equipped with pneumatic tires. Paris also has a number, but London has only one and Berlin two or three. One double-deck six-wheel bus in Berlin has balloon tires.

A novel feature of the Paris tires is a device to prevent them from splashing mud on nearby pedestrians. It consists of a thin fin of rubber which is outside of the tire tread. It is the same diameter as the tread and is molded as part of the tire. Paris was the only city in Europe in which this method of protection was noticed by the author of this article.



Left—Brussels bus at a down-town stopping point. Right—Six-wheel low-floor Hamburg bus with pneumatic tires

**Awarded First Prize
in Annual Contest**

Electric Railway Journal Maintenance Data Sheet
ROLLING STOCK—TRUCKS—14A

Grinding and Welding Wheels at the Same Time*

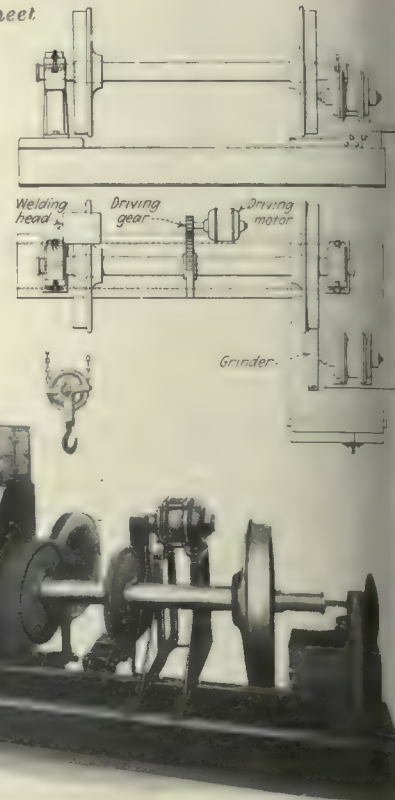
BY JAMES A. DUFFY

Superintendent of Equipment Monongahela-West Penn Public Service Company,
Fairmont, W. Va.

BY MEANS of a special machine drives the wheels through the shops of the Monongahela West Penn Public Service Company. In the shops of the Monongahela West Penn Public Service Company steel wheels are ground to proper flange and tread contour while the automatic electric welder builds up worn portions. By this arrangement one man can grind wheels, weld them with the automatic head and at the same time do miscellaneous hand welding. This has eliminated the wheel lathe as a necessary machine tool and the work has been speeded up considerably. A saving in machinist's time has resulted of about three hours per pair of wheels.

The machine consists of a bed-plate with two upright brackets with bearings for supporting the mounted wheels. A variable speed motor

gearing which is attached to the center of the axle. This gives 5, 7 and 13 in. per minute of peripheral speed. The welding head is of an automatic type and is attached to the machine. While welding up the flanges on one wheel, the opposite wheel is being ground. Special shaped grinding wheels are used so as to shape the tread and flange properly, and these grinding wheels are motor driven. The machine and gearing were made in the railway shop.



Machine arranged to hold a pair of wheels while the flanges and treads are being built up by welding and then ground

*Submitted in ELECTRIC RAILWAY JOURNAL Maintenance Contest.

**Awarded Second Prize
in Annual Contest**

Electric Railway Journal Maintenance Data Sheet
TRACK AND WAY DEPARTMENT—9

Hacksaw with Quick-Release Latch for Blade*

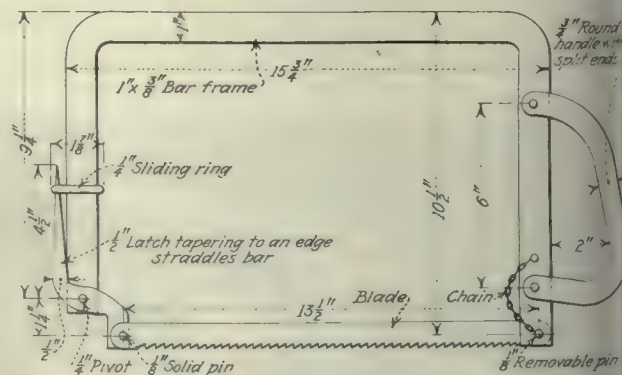
BY JOSEPH MERCIER

General Foreman Track Service Division, Montreal Tramways,
Montreal, Canada

A STURDY hacksaw in which the saw blades are held tightly for use or release instantly when desired has been developed by the track service division of the Montreal Tramways, Montreal, Canada. The frame is constructed of a mild steel bar 1 in. x 3/8 in. x 34 in. long, and is bent to form three sides of a rectangle with one leg an inch longer than the other. This longer leg is slotted to receive the saw blade, which is secured in place by a pin fastened conveniently to the frame by a short chain.

The opposite end of the saw blade is held by a mild steel "Z"-shaped latch which straddles the end of the other leg. This latch revolves on a pivot and may be tightened to bring any degree of tension to the blade desired by pressing on the sliding ring that secures it. A substantial 3/4-in. mild-steel handle is riveted solidly to the frame.

With this hacksaw the blade is held rigid at all times, and yet on the approach of a car the blade may



Hacksaw with quick-release attachment for blade

be released instantly to be left in the rail providing it will clear the wheel flange. Formerly many blades were broken while being removed quickly from a tight cut.

*Submitted in ELECTRIC RAILWAY JOURNAL Maintenance Contest.

**Awarded Third Prize
in Annual Contest**

Electric Railway Journal Maintenance Data Sheet
ROLLING STOCK—TRUCKS—15

Adjustable Mandrel for Babbitting Journal Brasses*

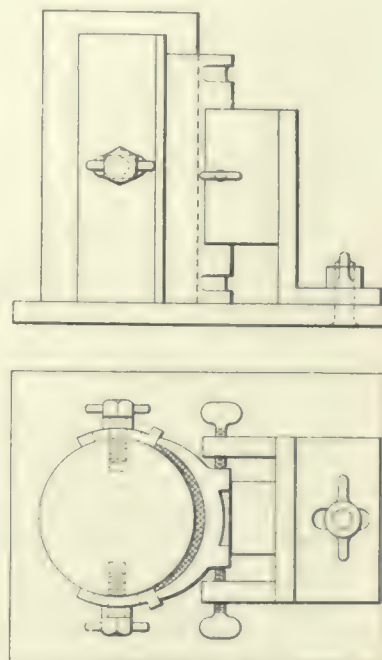
BY CHARLES HERMS

General Foreman San Diego Electric Railway, San Diego, Cal.

THE accompanying drawing shows a mandrel used by the San Diego Electric Railway for rebabbitting its journal brasses. This is adjustable so that various types can be poured on the same mandrel so long as the bore does not vary.

The adjustable feature of the mandrel reduces the time necessary for setting up to rebabbit a bearing and assures perfect alignment so that additional machining is unnecessary. They can be placed in service without danger of their running hot due to improper alignment with the axle. By means of the side adjusting plates, an odd brass can be rebabbit to the same thickness as standard brasses.

In pouring, the bottom of the mandrel base plate is marked to indicate the position of the back of the brass, in order to insure that this squares up and has the proper thickness at the bottom. The top is then adjusted to a gage, and the thumbscrews on the side of brass are tightened. The side adjusting plates are then moved up so as to close the gaps at the edges of the brass. The sides are then sealed with molder's clay and the babbitt is poured.



Journal bearing babbitting mandrel

*Submitted in *ELECTRIC RAILWAY JOURNAL Maintenance Contest*.

**Awarded Fourth Prize
in Annual Contest**

Electric Railway Journal Maintenance Data Sheet

LINE DEPARTMENT—3

Reclaiming Steel Trolley Poles by Electric Welding*

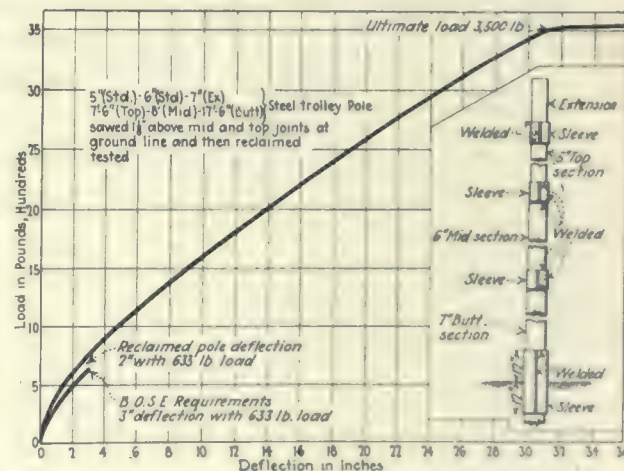
BY E. M. MILEY

Chicago Surface Lines, Chicago, Ill.

ORIGINALLY it was standard practice with the Chicago Surface Lines to set steel trolley poles without ground sleeves and with ornamental cast-iron collars around the joints. This method did not give protection to the poles from rust at the ground line and the ornamental collars formed rust pockets at the joints. As a result, after 25 years of service they are ready for the scrap heap. There are probably 25,000 poles on the system now in this condition.

Reclamation of these poles is now being carried out by a patented electric welding process that consists of welding a 24-in. beveled split sleeve to the pole at the ground line and an 8-in. beveled split sleeve at the joints. To determine the results of this method, a pole was cut into four pieces and was welded together with sleeves. When tested it was found that the welded pole had less deflection than a new pole under the same load. The results of the test are shown in the accompanying graph.

Recently two streets were widened to a 70-ft. roadway which required 500 steel poles, each 32 ft. long. In



Load deflection curve on reclaimed 30-ft. 5-in., 6-in., 7-in. steel trolley poles. Insert shows method of installing sleeves on poles

order to save the cost of new poles for this job, old 30-ft. poles were reclaimed and extended by using welded collars.

Poles can be welded either in the yard or in place on the line by use of the patented copper defining bar, at 40 per cent of the cost of new poles. When welded in place the labor of resetting and stripping the pole is saved, which amounts to approximately \$75 per pole.

*Submitted in *ELECTRIC RAILWAY JOURNAL Maintenance Contest*.

News of the Industry

Seven Cents in Fresno

Following authorization by the California Railroad Commission the Fresno Traction Company, Fresno, Cal., has put into effect 7-cent fares. Three rides are given by the company for 20 cents. The increase of 1 cent was allowed on the application of the company.

To increase further the earnings of the company a general rerouting of the various lines has become effective. In the opinion of the commission this rerouting and increased fare will enable the company to earn 6 per cent on its investment of \$1,325,000.

Wage Increase on Aurora Line

A three-year wage contract has been signed by the Chicago, Aurora & Elgin Railroad, Aurora, Ill., and its 450 employees providing for an increase of 1 cent an hour each year during the period. The rate for the current year will be increased from 75 to 76 cents for operators and from 63 to 64 cents for collectors until the maximum of 78 and 66 cents, respectively, is reached. Negotiations have been in progress since the expiration of the contracts last June.

Fare Testimony in Baltimore Continues

Charles D. Emmons, president of the United Railways & Electric Company, Baltimore, Md., testified before the Maryland Public Service Commission in a hearing on an application for an emergency rate pending action on a 10-cent permanent fare. The hearing has been under way for several days. Mr. Emmons was the first witness for the company. The municipality and several organizations are co-operating with the people's counsel in opposing an emergency rate.

In support of the company's application Mr. Emmons pointed out that the passenger revenue for the first eight months of 1927 shows a decline of \$293,329 compared with the corresponding period of last year. Since 1920, he said, there has been a loss of 28,678,548 revenue passengers, or 11.29 per cent.

The president gave the percentage of earnings for each year since 1920 as follows: 1920, 5.5; 1921, 4.95; 1922, 5.33; 1923, 5.43; 1924, 5.39; 1925, 5.47, and 1926, 5.39. He pointed out that in the last seven years the company had not earned the 6 per cent minimum established by the courts as a fair yield. This has not been earned, he said, despite fare increases and the practice of the greatest economies.

Mr. Emmons held that the automobile was one of the principal reasons for the decrease in car riders. He submitted a chart to the commission, in which he dealt with this subject. It was his contention that the company had lost in 1926 70,000,000 passengers who otherwise would have used the service of the railway.

Operating costs also have increased, Mr. Emmons testified, due principally to the fact that many persons have moved to the suburban sections, thereby increasing the number of car miles necessary to haul the passengers.

Higher Rates Sought in Michigan City

A petition for an increase in fare from 5 to 7 cents on local city lines in Michigan City, Ind., was filed with the Indiana Public Service Commission on Sept. 3 by R. R. Smith, receiver for the Chicago, South Bend & Northern Indiana Railway. The petition requested that the company also be authorized to sell four tickets for 25 cents with free transfers. It was brought out in the petition that a deficit of \$25,245 existed at the end of 1926.

Rapid Transit Practical for Cincinnati

Beeler report suggests tying in line with city railway under co-ordination of all forms of local transportation. Report well received by Cincinnati Street Railway and by local papers

THE Beeler report on rapid transit for Cincinnati, Ohio, was delivered on Sept. 9 to the Rapid Transit Committee. It is a document of 166 pages. The studies which he made led John A. Beeler, the author of the report, to the following conclusions:

1. The rapid transit line, if it were to be operated independently and without a system of transferring between it and other transportation agencies in Cincinnati, would carry only 6,060,000 revenue passengers the first year.

2. If it were to be operated as a part of a unified system comprising also the cars and buses of the Cincinnati Street Railway, the rapid transit line would carry

37,400,000 revenue passengers the first year, but most of these would be drawn from the present street railway system without the possibility of a saving in surface car service sufficient to offset the loss.

3. With a gradual merging of the independent bus lines with the unified system under a plan that would require the least expenditure on the part of the system, thus adding substantially to the traffic on the rapid transit and street railway lines, the operating loss from taking over the subway would be gradually overcome.

4. All of these conclusions are based on carrying out a number of important additions to the subway and changes in the existing surface system, among the most important of which are:

- (a) Extending the subway from Central Parkway and Walnut to Fountain Square.

- (b) Extending the line to Oakley and tying it in by a surface connection with Madisonville and Mariemont.

- (c) Relocating the Ludlow station at Knowlton's Corner.

- (d) Securing the Cincinnati, Hamilton & Dayton Railway as a tenant and serving the College Hill territory by that line.

- (e) Establishing prepayment stations for the easy and rapid interchange of passengers between surface and rapid transit cars.

Mr. Beeler says the practicability of a rapid transit line in Cincinnati has long been a moot question since most of the interurbans seeking better entrance to the business center have been eliminated. Upon the proper settlement of the question of the advisability of rapid transit as a betterment to the local transportation facilities may hinge the future greatness of the city. The population of the Cincinnati metropolitan district is about one-third that of Boston or Philadelphia, one-fifth that of Chicago, and less than one-tenth that of New York, but its transit project is not disproportionately large. In fact, the rugged topography and the wide spread of the industrial sections emphasize the necessity for it there.

COMING MEETINGS OF

Electric Railway and Allied Associations

Sept. 19-23—American Welding Society, national meeting, Book-Cadillac Hotel, Detroit, Mich.

Sept. 26-30 — National Safety Council, annual congress, Hotel Stevens, Chicago, Ill.

Oct. 3-7—American Electric Railway Association, annual convention, and exhibit, Public Auditorium, Cleveland, Ohio. Exhibits open at noon of Oct. 1.

Oct. 18-21—National Association of Railroad and Utilities Commissioners, thirty-ninth annual meeting, Baker Hotel, Dallas, Tex.

Oct. 26-27—Public Utilities Association of West Virginia, annual convention, Parkersburg, W. Va.

Oct. 26-27—Society Automotive Engineers, Transportation Section meeting, Hotel Sherman, Chicago, Ill.

As Mr. Beeler sees it, Cincinnati's topographical condition is responsible for the inception of the rapid transit line and for most of its local transportation troubles. Since the local transportation situation has recently been made the subject of negotiations resulting in the settlement of many troublesome questions, Mr. Beeler sees a clear field for mutual consideration of this important matter and a basis for working out a plan of operation that should leave little room for differences of opinion. According to him with a fixed return on the company's investment and a control by the city that wisely exercised must work to the distinct advantage of the public, an ideal condition exists. He says:

There is a general and prevailing belief in Cincinnati that the Rapid Transit Line to be used and useful must be a part of a city-wide system. In our opinion, too, this is a prerequisite to the whole undertaking. It is, therefore, quite unusual in that the city finds itself in the unusual position of negotiating through one branch of its government with the company for the operation of the Rapid Transit Line and of having the authority to approve or disapprove through another branch of its government the results of these negotiations. Far from opening the way to a disagreement or a deadlock, however, this condition will act toward facilitating an agreement on a sound basis far beyond what might be expected if the company were not under city control.

The problem, therefore, simplified and stated bluntly, is whether the people of Cincinnati, having put \$6,100,000 into an enterprise that is useless unless \$10,600,000 more is spent, can spend the additional amount on the ground that it will be of great advantage to the city as a whole and can ultimately be expected to pay a return on the additional investment at least. To answer this question explicitly, we would say that it can be done, but only with the maximum amount of co-operation, patience and fostering care, especially in the early years, and involving as the first step the unification of all local mass transportation into the one city-controlled system and diverting all possible business to the unified system, through such city control.

He expresses this opinion:

The new line will open up such sections and make it possible to reach an enlarged territory with a minimum cost.

The mere building of the line will advance business activity, while its operation will do much to force Cincinnati ahead, add to its prestige, relieve the ever-increasing congestion of traffic in the center of the city, increase property values and aid industrial enterprises by supplying their employees with rapid transit at a low cost. Of so great an advantage will this undertaking be that the community can well afford to pay the cost of carrying the investment for the early years, at least, if there is a reasonable hope that it can be made to pay its way later, and our conclusion is that this can be realized.

The city that 50 years ago built its own railroad through two states to the south to increase its commercial prosperity and pioneered with the greatest municipal university to perpetuate its social and cultural life should not be daunted today by a relatively small expenditure to insure its future prosperity. The foundation for a great city was laid by the forefathers who reckoned in results and not in first costs.

Be There for the Opening!

FOR the first time in the history of the American Electric Railway Association the executive committee has agreed to open the convention exhibit on Saturday. It urges early attendance. The New York special train leaves Friday night, arriving Saturday morning. Special cars carrying delegates from St. Louis begin to leave that city Friday. Some of the other delegations, however, are not scheduled to arrive until Monday.

Despite the fact that Wednesday will be set aside entirely for the inspection of exhibits, the tendency among delegates is to see the show at once upon arriving. By getting to Cleveland early this can be done before the sessions are scheduled to begin and without detracting from the value that attaches to the all-day inspection on Wednesday. There is a great deal to see. Get there early if it is at all possible to do so! The executive committee urges it. Moreover, you owe it to yourself to do so.

The significant question Mr. Beeler propounds is: "Will the present generation falter, even though the project cannot be made self-sustaining from the start?"

It was the need of obtaining a disinterested and enlightening answer that led to the employment of the Beeler Organization by the city of Cincinnati and the Cincinnati Street Railway, the first representing the taxpayer and the second the car rider, upon whom in some proper proportion will fall the cost of completing and operating the line if that is decided upon.

HOW THE RAILWAY FEELS

Walter A. Draper, president of the Cincinnati Street Railway, said that a complete and definite opinion of the Beeler report could be given only after it had been carefully analyzed. He said in part:

The conditions which Mr. Beeler states as requisite and precedent to the successful operation of the rapid transit line are not easy of accomplishment; in fact, it cannot be stated with certainty that all of these necessary conditions can be accomplished. One necessity he points out is the diversion to the rapid transit and surface system of all riders along routes of that system or in territory tributary thereto. In other words, there would have to be an elimination of any duplication of service and motor coach lines would be limited to territory that would not be served by the rapid transit and surface system. It is questionable how soon and how completely this could be accomplished. Other necessities are the serving of College Hill by the interurban line now there together with bus feeders, and also the serving of Cumminsville by the rapid transit line with bus feeders. These, and similar things which he indicates must be done in order to insure the success of the operation of the Rapid Transit Line, cannot be done arbitrarily. The report is very clear on these matters and points out just how much

will be lost to the new system by inability to carry out any one of his suggestions.

I have previously outlined the position of the Cincinnati Street Railway that if the rapid transit line can be operated in connection with the surface lines as part of one system so that a reasonable rate of fare will provide for the operating costs of the enlarged system plus the taxes and fixed charge of the present system as operated by this company, we are desirous of joining with the city in putting this structure to good use. It is quite desirable that the rapid transit line even to the extent now built shall not lie idle and unused.

On the other hand, it is a prime necessity that the existing transportation system, which is being improved each day to serve more adequately the people of Cincinnati, shall not be impaired or endangered either physically or as to its credit, since even with the completion of the rapid transit line the greater number of the traveling public will have to depend wholly or in part on the present system.

Under the plan of city control and a provision that the rate of fare shall be no more than the actual cost of giving the service, including a fixed return to the investors, the city is vitally interested in seeing that no mistake is made by which its transportation system might be called upon to assume a greater burden than it can carry.

HOW SHALL THE COST BE MET?

The question of practicability not only is involved, but there is also the problem of how the cost of building and operating the rapid transit line shall be distributed equitably between the general tax payer and the car rider. It is recognized, as Mr. Beeler has so clearly pointed out, that the operation of the rapid transit line will be a benefit to the city in relieving traffic congestion and in making new and remote sections of the city more readily accessible, thus opening up new territory for development and adding to the taxable values. It will add to Cincinnati's importance and prosperity in manifold ways. In these circumstances the public which uses the transportation facilities, that is, the car riders, should be called upon to pay for the additional and improved facilities offered by the rapid transit line only to an extent that is consistent with a reasonable rate of fare, adequate service and the maintenance of the system in good condition.

Fortunately the problem of dividing these costs equitably is one on which with proper understanding it is impossible for the company and the public to be arrayed on opposite sides, because the public itself is just as much interested as the company in seeing that any arrangement made is one that will be both practicable and equitable.

Mr. Draper promises a careful and detailed study of Mr. Beeler's report without delay from the point of view of the principles established in the city control and service-at-cost franchise, under which the company is operating and which so clearly fixes the responsibilities and protects the interests of the city, the riders and the company.

All four Cincinnati papers received the report favorably. The opinion of all of them was, perhaps, best reflected by the Cincinnati *Enquirer*, which for several years has included under the caption "The *Enquirer's* Platform for Cincinnati" the item "Building of Rapid Transit System With a Workable Plan of Operation."

New York Bus Hearing Sept. 26

The New York Transit Commission has set Sept. 26 for the first hearing on the application of the Equitable Coach Company for certificates of convenience and necessity covering the operation of bus lines in Manhattan, Brooklyn and Queens. Franchises for these were granted to the company by the Board of Estimate several weeks ago. It is expected that there will be strong oppositions to the granting of certificates. The Fifth Avenue-New York Railways interests in Manhattan are expected to oppose the granting of certificates for the cross-town lines in Manhattan and the Brooklyn-Manhattan Transit Corporation interests are expected to oppose certificates for Brooklyn, as the Coney Island & Gravesend Bus Corporation, a subsidiary of the Brooklyn-Manhattan Transit, was an unsuccessful bidder for the Brooklyn franchises. The franchises are subject to the approval of the commission on the basis of the convenience and necessity of the service intended to be given.

The Surface Transportation Corporation, a subsidiary of the Third Avenue Railway, has been granted a certificate of convenience and necessity by the Transit Commission authorizing it to operate twelve bus lines in the Bronx. The plan of financing the new bus service was also approved, the corporation being authorized to issue 1,000 shares of capital stock of a par value of \$100 a share, to provide working capital of \$60,000 and \$40,000 as a guarantee to be deposited with the City Comptroller. Slaughter Huff, president of the bus company, stated recently that it was the intention of the management to purchase 104 buses.

Fares on the bus routes will be 5 cents, with a 5-cent transfer fee to ten lines which the company has applied for in the Borough of Manhattan.

Buses to Run in Reno

The Reno Traction Company, Reno, Nev., suspended operation on Sept. 7. The line is to be scrapped. Buses have supplanted the railway system. The system was one of only 8 miles. It was until recently the sole survivor among the few roads built in that state.

Trial Service on Decatur, Ill., Route

The Illinois Power & Light Corporation has started bus line service on the Riverside route in Decatur, Ill., for a six months test period and suspended the railway service in that district. Two large buses are in the service.

Buses to Operate Between Chicago and Aurora Terminals

The Western Motor Coach Company has been granted a certificate of convenience and necessity to operate

buses between the Chicago and Aurora terminals of the Chicago, Aurora & Elgin Railroad. Col. Edward Blair, general manager of the road, said it would be about Nov. 1 before service was instituted. Six daily trips each way are proposed. Permit to operate between Geneva and Chicago and Elgin and Chicago is also to be sought.

Higher Fare Sought in St. Paul

The St. Paul City Railway, St. Paul, Minn., has petitioned the Minnesota Railroad and Warehouse Commission for an increased rate of fare to enable it to pay $7\frac{1}{2}$ per cent on a valuation of \$16,503,557. A hearing has been set for Oct. 14. Fixed tentatively in 1926, the rate is 8 cents cash and six tokens for 40 cents. It is believed that a minimum rate of 7 cents or more will be required to avoid a deficit which was shown in 1926 and which is the outlook for 1927. The petition cites that the return in 1926 was 4.42 per cent and based on figures for seven months will be 4.64 in 1927. The company arrived at the figures mentioned by taking the commission's valuation of 1925 and adding capital improvements made by the railway up to Jan. 1, 1927, or more than \$300,000.

In a fare decision of two years ago the commission said a higher rate of fare than then specified should be allowed the company, but it suggested certain remedies by the Council to let the rate be as low as in Minneapolis. An enabling city charter amendment presented to the voters was turned down in the fall of 1926 and again Sept. 6. This amendment allowed the city \$200,000 a year to take care of paving between tracks, sprinkling, sweeping and cleaning the tracks of snow and ice, and would have saved the company something like \$115,000 annually in a relief from these duties specified in the city charter.

T. Julian McGill, vice-president of the Twin City Rapid Transit Company, the holding organization, said that after exhausting every effort for two years "we have failed to get relief from unnecessary and unfair expenses which the carrier must pay. The company is now facing the necessity of refunding in the near future its bonded indebtedness and therefore it is essential that the earnings of the St. Paul City Railway be brought up to that authorized by law and agreed to by the City Council, the Railroad and Warehouse Commission, the United States Court and the company. The company will continue to give St. Paul its fullest co-operation."

Although the company is earning a reasonable return in Minneapolis at 8 cents and six tokens for 40 cents, St. Paul earnings in 1926 were \$500,000 below the necessary figure at the same rate of fare.

Economies recently proposed in St. Paul included the introduction of one-man cars, operation of short lines, re-routing of four lines and the elimination of owl cars on every other parallel line.

Details of Oklahoma Railway Purchase Made Public

Purchase of the majority of the preferred and the common stocks of the Oklahoma Railway, Oklahoma City, Okla., by a group of Oklahoma City citizens was officially announced on Sept. 6. The sale was made by the Southwest Securities Company to the following Oklahoma City people: William Mee of the Security National Bank, T. C. Thatcher of the Oklahoma City Mill & Elevator Company, A. E. Monroney of the Doc & Bill Furniture Company, H. R. Hudson of the Oklahoma City, Ada & Atoka Railway, O. A. Campbell of Campbell & Price, contractors, and G. A. Nichols of G. A. Nichols, Inc., real estate. New officers of the company will be: H. R. Hudson, president; G. A. Nichols, vice-president; Charles Hoopes, secretary; Reba Zimmerman, treasurer. The latter two are at present officers of the company.

The price paid to the Southwest Securities Company was \$275,000 for 29,828 shares of the common stock and 8,522 shares of the preferred stock. This is approximately 70 per cent of the outstanding stock.

The financial structure of the Oklahoma Railway is as follows:

Common stock issued, par value \$100 a share.....	\$3,800,000
Preferred stock issued, par value \$100 a share.....	1,795,900
Junior mortgage 6 per cent bond due Jan. 1, 1927.....	290,000
An unsecured 5 per cent note for.....	100,000
Collateral trust note 8 per cent, due Jan. 1, 1928.....	825,000
Underlying and first and refunding bonds, due in 1928 and 1941, 5 per cent.....	4,947,000

The purchasers have also acquired a majority of the \$290,000 junior mortgage bond issue and the unsecured 5 per cent note for \$100,000, also the Belle Isle Boating Company, a subsidiary of the Oklahoma Railway.

The property purchased comprises 65 miles of city railway and 75 miles of interurban railway. The lines are equipped with 129 cars. In addition, there are 26 buses. The power plant belonging to the company furnishes current for railway consumption and for the cities of Edmond, Guthrie, Cashion and Yukon, and the many industries located on its lines.

The Oklahoma Railway has been in the hands of the receivers since Dec. 27, 1924. The results of operation under this receivership have been better than in any previous years. The rapid growth of Oklahoma City is largely responsible for increase in business, according to those who are interested in the company, and anticipated future growth furnishes the motive for the purchase of the property.

Immediate operation of the property will remain unchanged, as it is necessary to confer with the court for its approval of the reorganization plan. The purchasers hope to lift the receivership within the next 30 days. Engineers have been employed to study the physical property and suggest additions and betterments.

Rochester Shoppers Use the Street Car

Eighty-nine per cent of the shoppers of Rochester, N. Y., use the street cars in going downtown, it was revealed by a survey conducted by Boy Scouts under direction of the Rochester Engineering Society. The Scouts interviewed all shoppers in sight and found only 11 per cent went in automobiles. A proposed ordinance to eliminate parking downtown between the hours of 4:30 and 6 p.m., the rush hours, brought about the survey, the results of which, backers of the proposal claim, showed that such a plan would not inconvenience any large proportion of the public.

Bond Application of Brooklyn Company Denied

The New York Transit Commission on Sept. 7 denied the application of the Brooklyn-Manhattan Transit Corporation for a rehearing on its proposal for an issue of \$20,000,000 of ten-year 5 per cent gold bonds for equipment purposes, the bonds to be sold by the New York Rapid Transit Corporation, the operating company, to the B. M. T., the holding company, at a price of 80.

The original application of the company was denied several weeks ago after the proposal had been condemned by Samuel Untermyer, special counsel for the commission. In its application for a rehearing the company said the commission had exceeded its powers, confusing its duties as a regulatory body with its duties as agent for the city under Contract No. 4.

It is expected that the company will appeal to the Appellate Division for a writ of certiorari, thus making certain a court review of the matter. This, too, had been anticipated and the application for a rehearing was regarded as a necessary preliminary to court action.

Mr. Untermyer contended that the selling of the bonds of the operating company to the holding company at 80, inasmuch as it would yield only \$16,000,000 to the operating company, would cause a loss of \$4,000,000, ultimately, to the city, in the event of the recapture of the city-owned lines as provided for under contract 4 and as contemplated in the proposed unification plan.

Gain in Rides on Chicago Surface Lines

For the first seven months of 1927 the increase in riding on the Chicago Surface Lines, Chicago, Ill., over a similar period in 1926 was 9,656,768. Only June and July showed decreased business. The report showed that nearly 71,000,000 of the July rides were on original payment of fare and nearly 54,000,000 were on transfers. Free passengers totaled 3,600,390. For July divisible receipts were \$268,682 after expenses, taxes, interest on purchase price and other charges, against \$417,814 in June and \$310,840 in July, 1926.

Personal Items

Messrs. Venning and Clark Among Cincinnati Men Promoted

Several important promotions in the operating departments of the Cincinnati Street Railway, Cincinnati, Ohio, have been announced by J. H. Stewart, general manager. These advancements, which became effective on Sept. 1, are designed to take care of the company's new system of power distribution.

F. J. Venning will continue as superintendent of power, but in addition will have jurisdiction over the Pendleton power house and all operations incident to the production of power. He will have charge over the transmission lines to the point where current is delivered to switches in the substations and all feeder lines from the time they leave the substations, as well as the overhead trolley lines. Mr. Venning affiliated himself with the company in 1910 as superintendent of construction.

W. P. Clark, paving engineer, was promoted to assistant superintendent of track and roadway and will work under the supervision of J. H. Sundmaker, superintendent of maintenance of way. Mr. Clark will assist Mr. Sundmaker in handling the large program of track reconstruction work which is being carried on by the company.

H. L. Swift, assistant superintendent of maintenance of way, was appointed superintendent of substations and will have jurisdiction over the maintenance of present stations and the construction of the new stations, including the installation of the equipment. Mr. Swift formerly was with the American Window Glass Company, Monongahela, Pa.

J. A. Noertker, who entered the employ of the company in 1921 as a draftsman after his graduation from the University of Cincinnati, was appointed electrical engineer. He will look after the electrical engineering details connected with the installation of the new substations.

H. C. Genrich, who started with the company in 1895 as trouble lineman and rose to the office of electrician, was appointed chief electrician. He will continue to supervise the inspection and the maintenance of the present substations and will assist in the work of constructing the new ones.

Messrs. Robinson and Murray Advanced

A. E. Robinson and W. H. Murray have been made assistant purchasing agents of the Georgia Power Company, Atlanta, Ga. While Mr. Robinson has been assigned to the parent company, Mr. Murray will be connected with the Empire Construction Company, a subsidiary. F. A. Jordan, supervisor of purchases, announced the promotions.

Mr. Robinson has been with the Georgia utility for more than fourteen

years, having served in the purchasing department for the past twelve years. Mr. Murray has been with the company for four years, the entire period having been spent in the purchasing department.

Changes in Wisconsin Property

John I. Allen has been named assistant secretary-treasurer of the Wisconsin Gas & Electric Company, Milwaukee, Wis. In this capacity he succeeds the late Emil Jorgenson.

G. N. Bingen was appointed auditor. He succeeds Mr. Allen.

H. R. Hudson Heads Oklahoma Railway

H. R. Hudson, elected president of the Oklahoma Railway, Oklahoma City, Okla., by the new owners of that property, is president of the Oklahoma City, Ada & Atoka Railway, which operates steam railway lines from Oklahoma City to Shawnee, Ada, Atoka and intermediate points.

OBITUARY

ZIBA F. GRAHAM, who established and built the first Washington, Ind., railway system and operated it until a few years ago, when he sold the line to the city of Washington, died at Conway, Mich., on Sept. 6. He also owned the electric light plant in Washington at one time. Mr. Graham was 74 years old. He was the father of Joseph B., Robert C. and Ray A. Graham, prominent automobile manufacturers.

FRANK GRAHAM JONES, former general manager of the Memphis Street Railway, Memphis, Tenn., died on Sept. 9 at the Mayo Clinic in Rochester, Minn. He went to Memphis from New York State in 1893 and became general manager of the old Citizens Railway. Under his management this company did much development work including the taking over of smaller lines and the double tracking of the east end line. He served as manager until the line was merged with the former Memphis Power & Light Company. In the ownership of the Memphis property he was for twenty years a partner of G. K. G. Billings. In 1918 Mr. Jones was appointed a fuel director for the District of Columbia by the United States Fuel Administration. He was 69 years old.

A. W. WEYKER, long connected with the Milwaukee Electric Railway & Light Company, Milwaukee, Wis., and in recent years in charge of the railway lines of that company in Racine, died recently.

Manufactures *and the* Markets

Delegates Urged to Attend Exhibits Opening Oct. 1

Members of the exhibit committee are urging delegates to arrive in Cleveland in time for the opening of the exhibits at noon on Oct. 1, as this will permit leisurely inspection before the convention rush. Exhibits will be open to the public on Oct. 2, from 2 to 5 p.m. and on Oct. 5 from 7 to 10 p.m. The public showing is under the auspices of the Cleveland convention committee. By arriving on Saturday and viewing the exhibit en family, so to speak, delegates, it is thought, will gain a better idea of the big show, and will have time to discuss the features in a technical manner undisturbed by the public and the pressure of other convention business.

Virginia Electric to Double-track Ocean View Line

Officials of the Virginia Electric & Power Company, Richmond, Va., express their intention of beginning the double-tracking of the Bay Shore-Norfolk Street car line to Ocean View as soon as the right-of-way is clear. The company recently allocated \$207,000 to the project.

Most of the right-of-way for the second track is clear and the company does not expect to have serious difficulty in completing it.

\$750,000 for Power System Announced in Cincinnati

Contracts involving the expenditure of \$750,000 for a complete new power distribution system of eighteen substations have been awarded by the Cincinnati Street Railway, Cincinnati, Ohio. The eighteen substations will be situated at various points throughout the city, and as soon as the new equipment can be placed in operation the railway company will purchase its entire power supply from the Union Gas & Electric Company, a subsidiary of the Columbia Gas & Electric Company, New York.

Officials of the railway state that the new arrangement not only will result in economy in operation but will provide the system with an adequate power supply, permitting faster and more dependable service throughout its system. With the thought of eventually obtaining all of its power from the Union Gas & Electric Company, the Cincinnati utility, in 1921, entered into a contract with the union company for the purchase of one-half of its power. The power the Union Gas & Electric Company generates is 60-cycle alternating current, while the generating equipment of the railways is 25-cycle. This has prevented an interchange of power between the two companies and the sub-

stations which were supplied with the Union Gas & Electric Company's power were equipped with converters which could not be hooked up with the Pendleton station supply. At times this condition caused considerable difficulty, as it made it impossible to feed sections of the system normally applied by one source with current from the other source.

Engineers of the railway have been engaged for more than a year preparing plans and specifications for the new substation layout.

First Come First Served Rule on Track Exhibit Space

Before he left on Sept. 15 for Cleveland, where he will establish headquarters of the exhibit committee in the Cleveland Auditorium, Fred C. J. Dell announced that in order to avoid traffic congestion near the auditorium the rule of "first come first served" will hold for exhibits to be placed on the track space.

"Assignments of track space have been forwarded to all exhibitors whose applications have come in," explained Mr. Dell. "While tracks have been assigned to certain companies, much depends on how the exhibit cars arrive in Cleveland.

"Charles H. Clark, engineer of maintenance of way Cleveland Railway, who is chairman of our special sub-committee on car exhibits, will have charge of placing all of the car equipment upon

METAL, COAL AND MATERIAL PRICES—
F. O. B. REFINERY

Metals—New York

Sept. 13, 1927

Copper, electrolytic, cents per lb.....	12.95
Copper wire, cents per lb.....	15.25
Lead, cents per lb.....	6.125
Zinc, cents per lb.....	6.25
Tin, Straits, cents per lb.....	61.875

Bituminous Coal, f.o.b. Mines

Smokeless mine run, f.o.b. vessel, Hampton Roads, gross tons.....	\$4.325
Somerset mine run, Boston, net tons.....	1.85
Pittsburgh mine run, Pittsburgh, net tons.....	1.95
Franklin, Ill., screenings, Chicago, net tons.....	†
Central, Ill., screenings, Chicago, net tons.....	†
Kansas screenings, Kansas City, net tons.....	2.675
†Quotations withdrawn because of strike.	

Materials

Rubber-covered wire, N. Y., No. 14, per 1,000 ft.	\$5.55
Weatherproof wire base, N.Y., cents per lb.	5.20-5.70
Cement, Chicago net prices, without bags.	2.05
Linseed oil (5-bbl. lots), N.Y., cents per lb.	11.0
White lead in oil (100-lb. keg), N.Y., cents per lb.	13.75
Turpentine (bbl. lots), N.Y., cents per gal.	61.0

exhibition tracks. Owing to the necessity of eliminating any traffic delays on the busy thoroughfares near the auditorium, Mr. Clark will seek to handle cars so as to economize time in getting them placed in the exhibit area set aside for car displays."

"This means" explained Mr. Dell, "that while a certain company may have been assigned to a certain track, that carries no assurance that the company's car or cars will go on that track. These cars are to be placed in the exhibit area with the aid of a portable curved switch. The switch must be moved with a crane, attached to a work car and it is not practical to move the switch from one track to another, because every time it is moved the street cars on St. Clair Avenue and the automobile and truck traffic is delayed, at least that portion of it going in the westerly direction."

**This is Station A.E.R.A., Cleveland, Ohio
Fred Dell announcing**

We are broadcasting a special announcement from the Cleveland Auditorium, where, on and after

September 19

all mail and wires on exhibit
business should be addressed to

American Electric Railway Association

Fred C. J. Dell, Director of Exhibits

Cleveland Public Auditorium
Cleveland, Ohio

*To facilitate deliveries to your representatives,
address mail as follows:*

Mr.
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Tell the home folks to send boomerang mail — return address on each letter

Please Stand by for Further Announcements

"MODERN" PLANTS

True as in 1894

SSTONE & WEBSTER, Inc., built a station in 1894. An account, "A Modern Power Plant," contains these words:

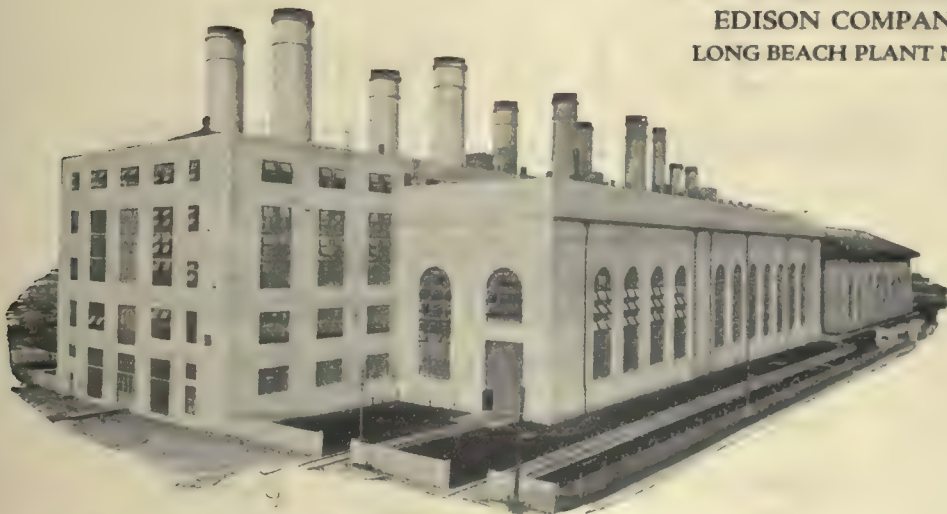
A complete mechanism, every part designed to work with every other part ... in case of accident to any member, some other can perform its duty ... energy put on the line surely and cheaply ... must be no shutdowns, either steam or electrical ... every device and arrangement a good investment ... constructed and equipped under constant supervision and care.

Written when 2000 kw. was an important installation, this remains a good description of Stone & Webster power work. It shows the sound early foundation on which rests the experience offered Stone & Webster clients today.



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The major problems confronting every street railway manager are service improvements and economical operation.

The ever increasing number of automotive conveyances and the changing street traffic conditions are making it much more difficult to meet these problems.

Have these factors affected your property in such a way that the remedies tried have been found wanting?

Have these remedies included a comprehensive survey of operating problems, and the street traffic conditions affecting them, made by engineers familiar with the complex legal, civic, operating and financial phases of transportation?

Such a survey covering routing, speed, safety, control of street traffic, the installation and operation of traffic signals, and similar matters often leads to marked service improvements.

We have been successful in relieving traffic conditions, improving service and reducing operating costs, and also in aiding to bring about better public relations in a number of cities. It is possible that we can serve you in a similar manner.

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THE operated properties form one of the largest groups of utilities in the United States, engaged principally in the production and sale of electricity for light and power, and gas as fuel—serving 549 cities and towns with a population estimated in excess of 2,000,000. Electric railway and motor bus service is furnished in Nashville and Chattanooga,

Tennessee; Evansville, Indiana; and Springfield, Illinois. Electric light and power service is also rendered in these cities. Among the other larger cities served are—Grand Rapids, Jackson, Lansing, Flint, Kalamazoo, Muskegon, Pontiac, Battle Creek, Bay City and Saginaw, Michigan; Springfield, Ohio; and Peoria, Illinois.

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1,943 Miles of Gas Mains
40,825,000 Cu. Ft. Daily Manufacturing Capacity
17,718,000 Cu. Ft. Storage Capacity

RECORD OF GROWTH

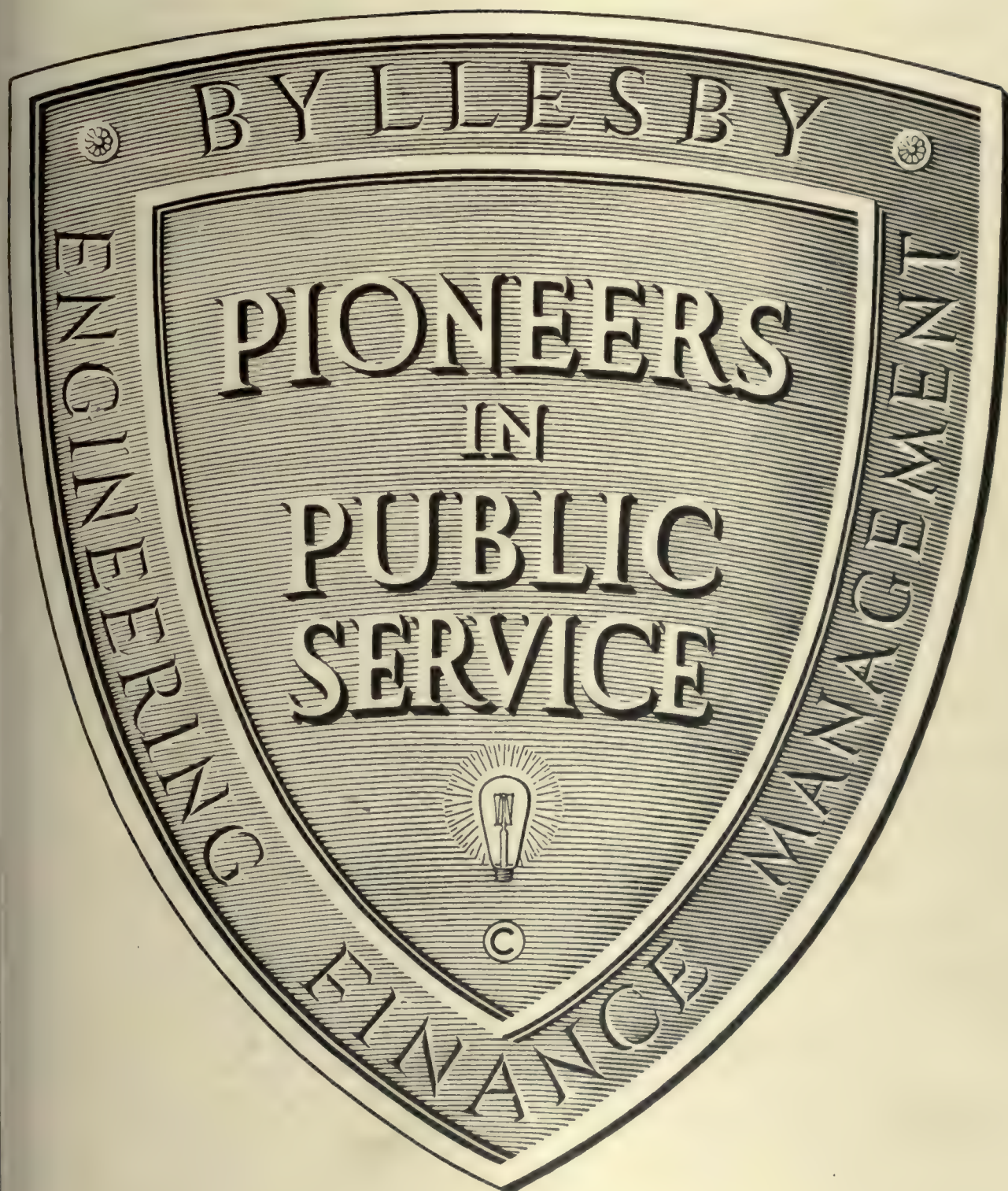
Year	Gross Earnings*	Electric Sales in K. W. H.*	Electric Customers*	Gas Sales in Cubic Feet	Gas Customers	Revenue Passengers Carried*
1927†	\$51,818,618	1,507,077,704	451,192	6,353,513,200	178,889	67,985,594
1926	49,197,543	1,429,553,946	433,664	5,939,658,600	171,280	68,362,015
1925	44,174,864	1,277,370,522	391,960	5,310,973,900	158,745	68,807,316
1924	39,314,810	1,005,855,275	354,613	4,337,707,400	143,016	68,649,989
1923	37,442,596	979,681,098	317,116	4,249,271,600	119,103	71,016,441
1922	32,144,695	750,346,913	264,027	3,807,422,300	111,513	70,337,995

* These figures are prepared on basis of giving effect for the full period to the acquisition of the Tennessee Electric Power Company under Plan which became effective in July, 1925.
† Twelve months ended July 31, 1927.

Over 70% of the gross revenue of the properties is contributed by the Electric Department. The interesting fact about this phase of the business is the evenly balanced character of service rendered. About one-half is utilized for lighting, being divided

almost equally between residence and commercial lighting and the other half is taken principally by industrial power customers, a small part being delivered to other public utilities.

There are more than 70,000 shareholders of Commonwealth Power Corporation and its subsidiary companies



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When writing the advertiser for information or prices, a mention of the Electric Railway Journal would be appreciated.

Transmission Line and Special Crossing Structures, Catenary Bridges

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Investigations • Reports

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The American Appraisal Company

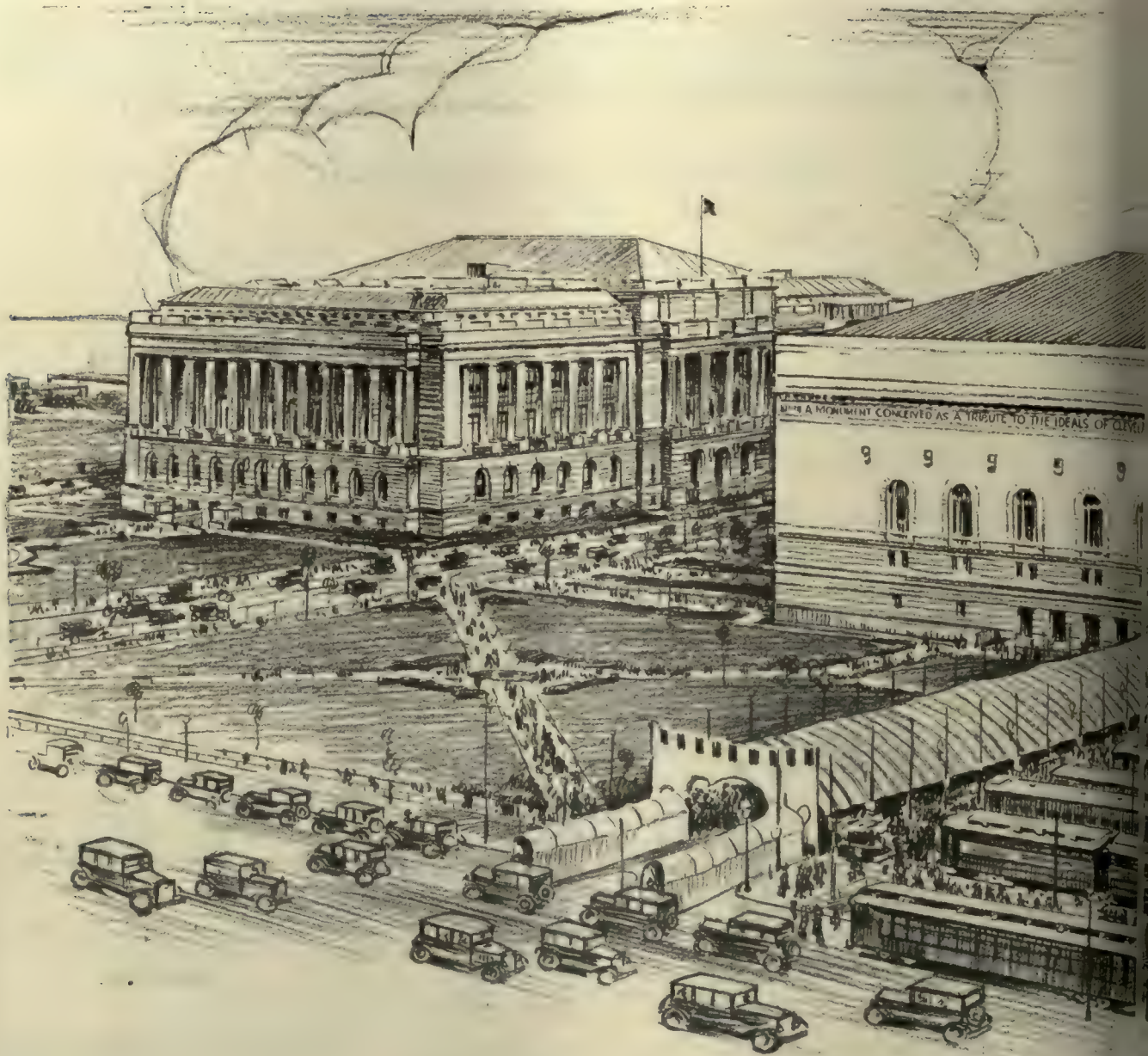
A National Organization

Kalamazoo Trolley Wheels

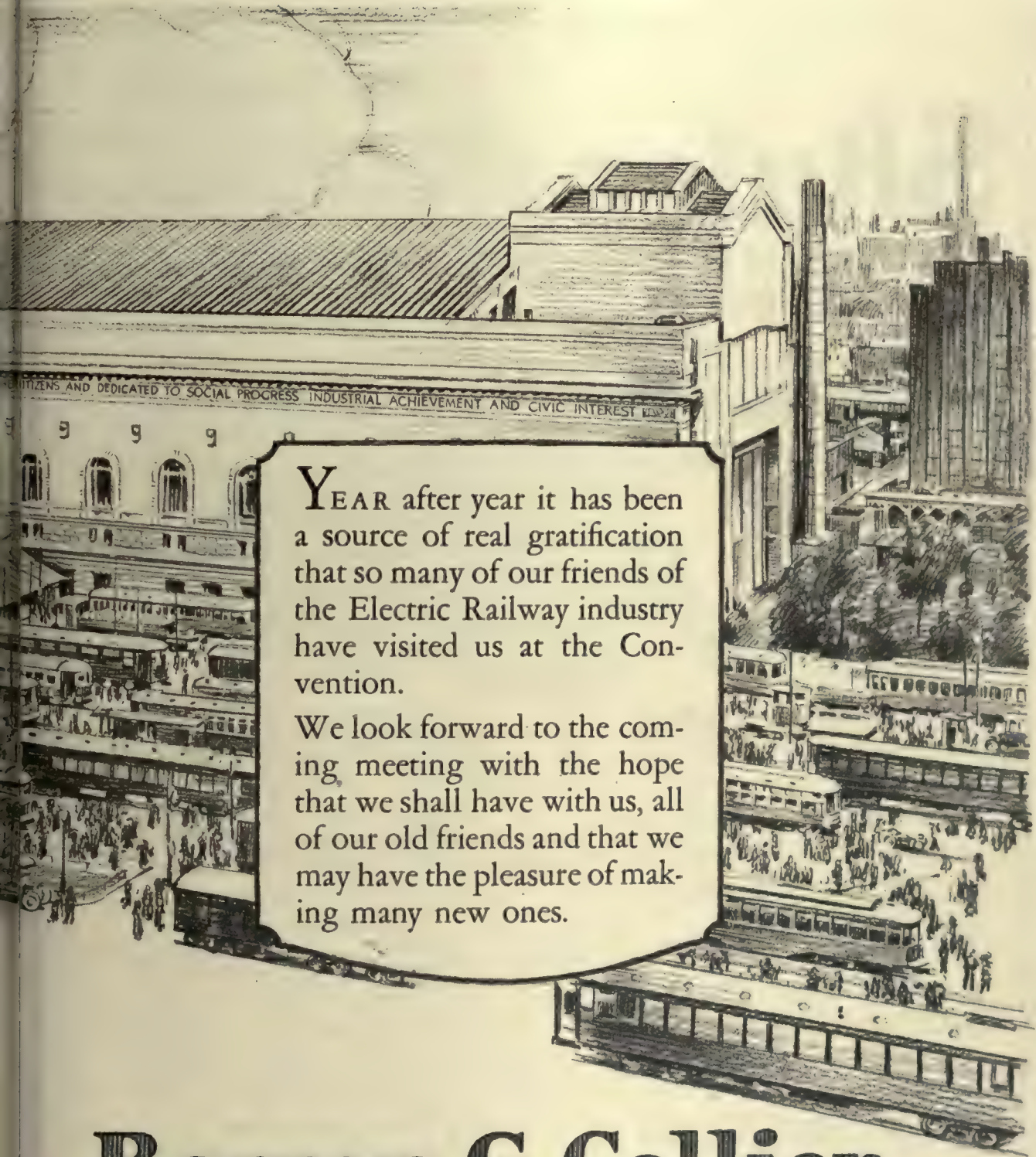
The value of Kalamazoo Trolley Wheels and Harps has been demonstrated by large and small electric railway systems for a period of thirty years. Being exclusive manufacturers, with no other lines to maintain, it is through the high quality of our product that we merit the large patronage we now enjoy. With the assurance that you pay no premium for quality we will appreciate your inquiries.



THE STAR BRASS WORKS
KALAMAZOO, MICH., U. S. A.



Car Card Advertising



YEAR after year it has been a source of real gratification that so many of our friends of the Electric Railway industry have visited us at the Convention.

We look forward to the coming meeting with the hope that we shall have with us, all of our old friends and that we may have the pleasure of making many new ones.

Barron G. Collier

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Member of Motor Truck Industries, Inc.
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This Paper is a "Member of the A.B.P."

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The "A.B.P." is built upon and revolves around the following set of standards —

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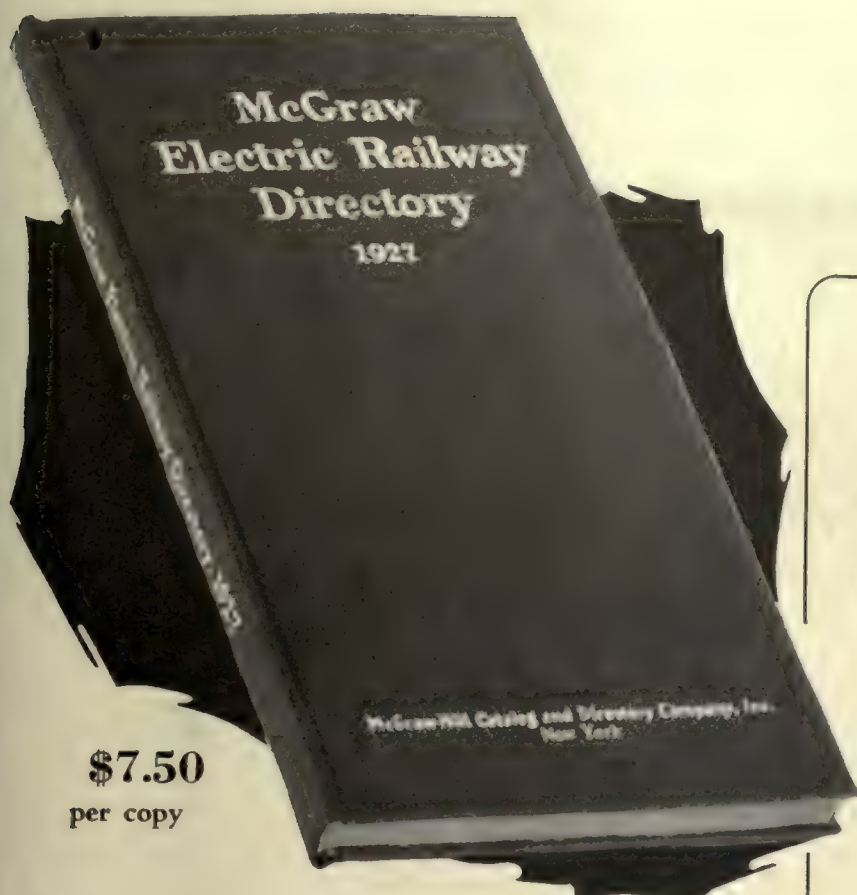
THE publisher of a business paper should dedicate his best efforts to the cause of Business and Social Service, and to this end should pledge himself—

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4. To refuse to publish "puffs," free reading notices or paid "write-ups"; to keep his reading columns independent of advertising considerations, and to measure all news by this standard: "Is it real news?"
5. To decline any advertisement which has a tendency to mislead or which does not conform to business integrity.
6. To solicit subscriptions and advertising solely upon the merits of the publication.
7. To supply advertisers with full information regarding character and extent of circulation statements, subjects to proper and authentic verification.
8. To co-operate with all organizations and individuals engaged in creative advertising work.
9. To avoid unfair competition.
10. To determine what is the highest and largest function of the field which he serves, and then to strive in every legitimate way to promote that function.

Publications which have subscribed to these standards have earned the preferred consideration accorded them.

THE ASSOCIATED BUSINESS PAPERS, INC.

52 Vanderbilt Ave., New York



\$7.50
per copy

New Edition Now Ready!

The standard reference authority of the Electric Railway Industry now available in a new, completely revised edition. Brought up to date from data gathered by direct contact with the more than 1,300 companies listed.

Arranged in a new type style affording greater legibility and quicker reference.

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If you haven't sent in your order for the new Edition—fill out the convenient memo on this page and mail it today!

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A complete directory of the electric railway companies in the United States, Canada, Mexico and the West Indies.

Names and addresses of officials and principal department heads, including purchasing agents, master mechanics, supt. of power plants, etc.

Names of subsidiary bus companies.

Names of principal communities reached by each company.

Names and addresses and officers of affiliated holding or controlling companies and lists of properties controlled by each.

Location of repair shops.

Location and the total capacity of power plants.

Mileage of the road, owned, leased and trackage rights.

Gage of track.

Number and kind of cars used.

Number of buses operated.

Number of garages, capacity and their location.

Rates of fare.

Transmission and trolley voltages.

Officers and executive committees of Electric Railway Associations.

Commissioners and principal assistants of National and State Railway and Public Utility Commissions.

Alphabetical list of electric railway officials, giving company connections.

McGraw Electric Railway Directory,
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Gentlemen:

Please send _____ copies of the 1927 Edition to

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Attention of _____

THE operator of a public transportation system has a responsibility to the public and to the owners of his property which requires him to view his problem from the standpoint of a purveyor of transportation, and not as a street railway man, a motorbus man, or a taxicab man.

He must be quick to recognize every change in public taste, and to the limit of his ability supply the kind of passenger transport that best meets the public need. If he does not, somebody else will. The resultant competition may cost millions, which will ultimately be paid by the public and the owners whom he serves.

This is the principle which underlies Mitten Management practice as exemplified on the transportation lines of Philadelphia Rapid Transit system.



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AS soon as they are able to toddle, all Kaffir girls are made to carry something on their heads.

This develops poise and dexterity in carrying ever-increasing loads as they grow older.

In simplified form it is the same idea that the text pages of this issue

advocate development to handle ever-increasing traffic.

And this is inserted as a P.S. to the text pages: All betterments of equipment and handling are figured on the basis of proper motor operation.

To provide this is the sole function of Morganite brushes.

Morganite
Brush Co., Inc.

Main Office and Factory at 3302-3320 Anable Ave., Long Island City, N. Y.



Reviving a Business with INDUSTRIAL ADVERTISING

HOW OFTEN have the major markets of some great business disappeared without notice, because of fashion's change, a revolutionary scientific discovery or some strong, uncombatale force.

What is a great business to do? Retire with honor? Or revive with glory? Here is the story of one manufacturer who chose the latter course.

Life in the Balance

The Armistice, shortly followed by the "5-5-3 agreement" on naval limitations, cut this manufacturer's market to a critical fraction of his plant capacity. His corporate life hung in the balance. With the vanishing of the old market, this producer resourcefully turned to a comparatively new, and at that time little used secondary product.

A research bureau was established to determine the adaptability of the new product to different industries. As sales opportunities unfolded, salesmen were trained as specialists in the specific fields. The selling was pitched on the high plane of genuine service to the buyer. There was no promiscuous selling—no knocking at doors in hope that prospects would be found within.

Industrial Advertising, conceived to build industrial recognition for this new product and its salesmen, was

planned and scheduled with the same shrewd regard for specialization. The counsel of an experienced advertising agent was obtained. The Industrial Advertising, geared to the self-interests of the different classes of industrial buyers, was persistently published in McGraw-Hill Publications.

A Sensational Recovery

Aided by the power and force of Industrial Advertising, this producer "cheated the mourners" by developing a volume for the new product far in excess of the highest peak of any previous prosperity. And this achievement took place while the general business trend in collateral industries was in a declining direction.

If Industrial Advertising, co-ordinated with an Industrial Marketing plan, can rehabilitate a declining business, who can estimate its power and force when aided by favorable circumstances?

This sensational recovery was not the result of some miraculous chance. It was the outcome of just such common-sense marketing methods as are formulated in the McGraw-Hill book, "Industrial Marketing at Work." If you are an executive interested in the national industrial market, a McGraw-Hill representative will leave a copy of this book with you or your advertising agent. Notify the nearest McGraw-Hill office.



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WISCONSIN Axles have been identified prominently with passenger transportation since the inception of the modern coach. They were used on the first low slung chassis built in this country and have since established records for mileage and low up-keep cost.

Wisconsin Axles are produced for trucks rated from 1 to 7 tons—for buses seating 15 to 60 passengers.

Special designs are available for rail-cars, gas-electrics and tractors.

In recognition of the principle that only the best can endure and with complete knowledge of the severe service which buses encounter, Wisconsin Axles are designed and built to provide every feature essential to successful operation.

Strength—Efficiency—Long Life—Real Brakes

Wisconsin Parts Company - Oshkosh, Wis.

Lower

**First Cost
Operating Cost
Maintenance
Depreciation**

MEAN GREATER PROFITS



Heavy Duty Bus Chassis *by*
STUDEBAKER

Greater Profits



Looking forward from the club section of the parlor car. Note the deep lounging seats, wide aisle and inviting atmosphere.

THE STUDEBAKER PARLOR CAR for 20 passengers affords a de luxe service for inter-city and suburban schedules. The interior is particularly attractive. The seats are individual armchairs, upholstered in genuine leather with cane sides. Mohair head lining and side linings with the curtained windows and inset mirror panels, lend a drawing room atmosphere to the interior. Special provision is made for hand luggage which is stored in a well at the driver's right. In this bus de luxe as in all other Studebaker busses, quality is of the highest order. The notably low first cost and operating costs give greater profits with less invested capital.

\$6895

f. o. b. factory



The Studebaker

75

With Less Capital

THE NEW "75" STUDEBAKER CHASSIS of 184-inch wheelbase is a masterpiece of rugged construction. Its stamina has been proved by thousands of miles of gruelling tests over the most difficult routes, through deep sand, clinging gumbo, over steep grades, as well as on Studebaker's 800-acre proving ground where speeds of 60 miles per hour were attained. Here the brake tests proved that the "75" chassis carrying a load of 7500 pounds was stopped in 17 feet at 20 miles per hour using a pedal pressure of only 175 pounds which is the same pressure ordinarily required for passenger cars.

The powerful Studebaker motor is carried on its own sub-frame giving perfect alignment between the motor and transmission and reducing torsional vibration. Back of the special four-speed forward transmission is a propeller shaft of 3-inch steel tubing. The rear axle with its heavy gears and powerful shafts of chrome molybdenum steel is easily accessible for adjustment. A low center of gravity is obtained and rear ramp eliminated by dropping the frame back of the wheel housing. Nine stout cross-members, including two large tubular units, give great rigidity to the 8-inch pressed steel frame.

Studebaker's latest development is the "75" Junior, a chassis of 158-inch wheelbase, having the same powerful motor, rear axle and other units. It differs only from the larger "75" in its length and transmission, which is of the three speed type. This chassis was designed to carry the 12 and 15 passenger cross-seat sedan type bodies for which there is a large demand.

Studebaker Bus Models and Prices

"75" Model—184" wheelbase—Dual Rear Wheels	
Chassis Only	\$3275
19-passenger Cross-seat Sedan*	5675
21-passenger Street Car Bus	5895
22-passenger Parlor Observation Car	6895
20-passenger Parlor Car De Luxe	6895
*Single rear wheels; for dual wheels add \$100.	

"75" Junior Model—158" Wheelbase

Chassis Only	\$2410
12-passenger Cross-Seat Sedan	4160
15-passenger Cross-Seat Sedan	4520
Single wheel high pressure tires or dual wheels and balloon tires optional without extra cost.	

All prices f.o.b. factory. Purchase can be arranged on Studebaker's liberal budget payment plan.

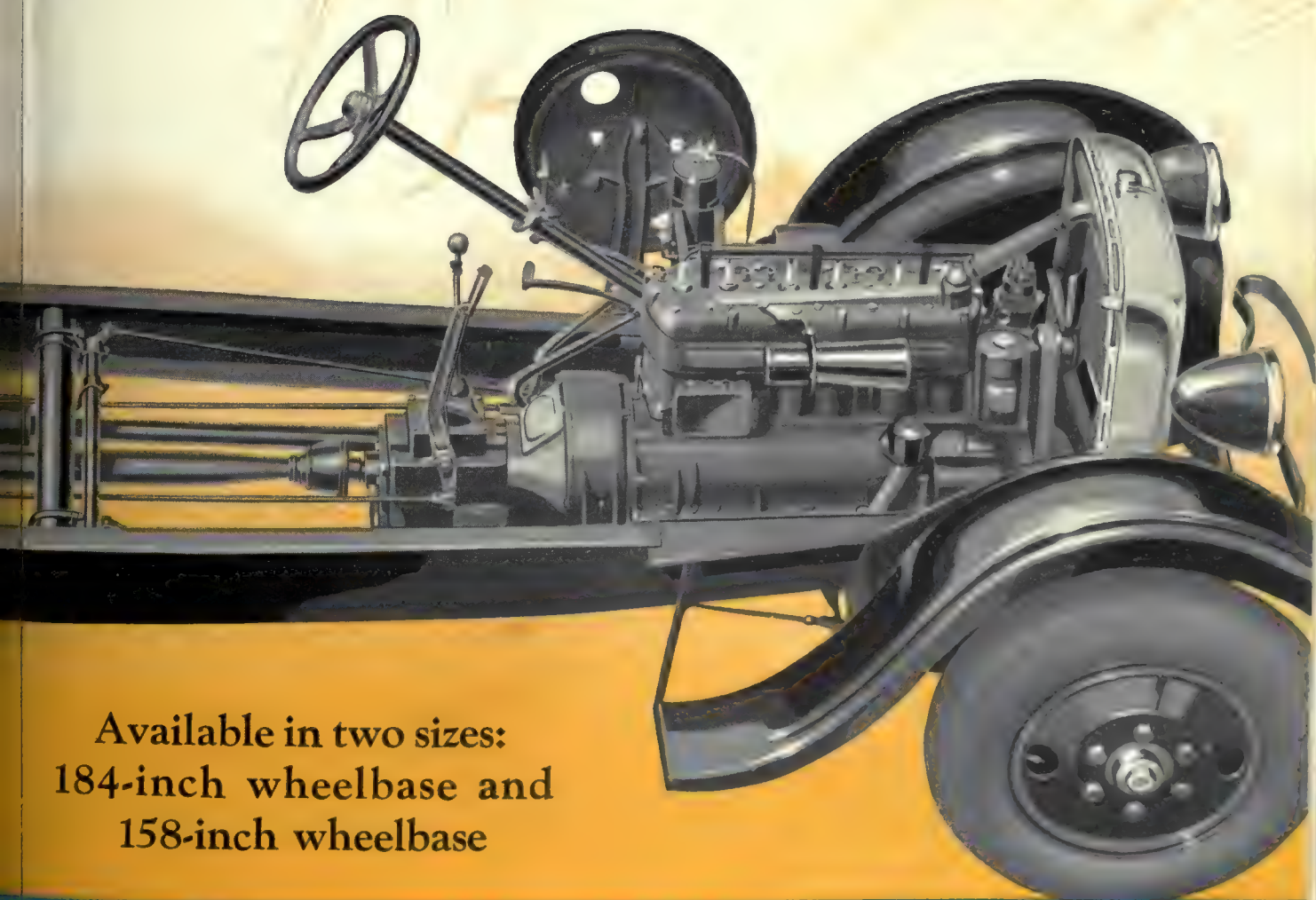


Heavy Duty Bus Chassis



The Studebaker
"75" Heavy Duty
Bus Chassis

The most powerful Bus Chassis



Available in two sizes:
184-inch wheelbase and
158-inch wheelbase

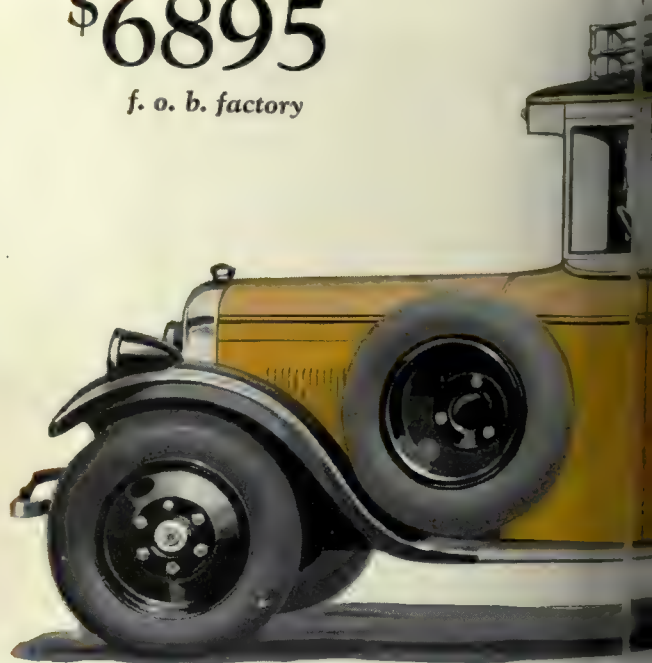
of its size and weight in the world

The Inbuilt Quality



ULTRA-MODERN in every sense of the term, The Seminole, Studebaker's new observation car for 22 passengers, meets a very definite transportation need. Operators catering to a discriminating public find that The Seminole possesses a high degree of comfort and luxury which is so essential for inter-urban traffic or extended tours over scenic routes. Its long, low body lines, which blend smoothly into the cowl and hood suggest the conventional Pullman in appearance. This impression is furthered by the ornamental grille work and rear awning. Mounted on the "75" chassis it has ample power for mountain work. Its four-wheel brakes give absolute control.

\$6895
f. o. b. factory



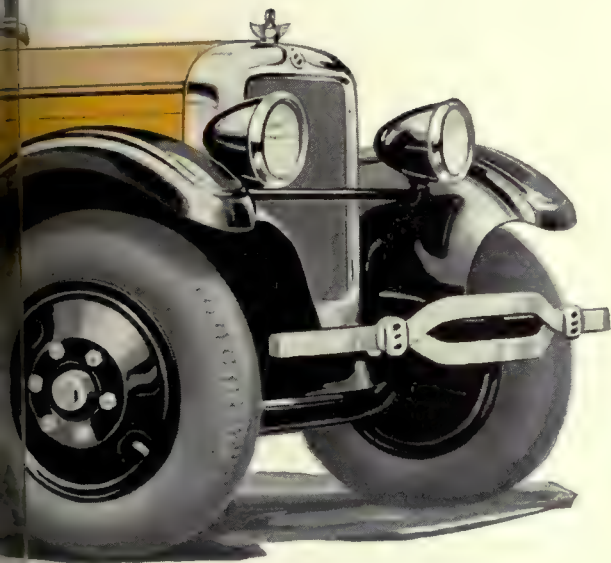
The Studebaker



Insures Satisfaction

\$5895

f. o. b. factory



THIS PAY-ENTER STREET CAR BUS for 21 passengers is of advanced design giving a new measure of riding comfort not generally found in street car busses. The deep upholstered seats are arranged to provide plenty of leg room with a wide aisle which allows easy access to any part of the interior. Special attention has been paid to proper ventilation and heating. Wide, easily adjusted windows and brilliant illumination—the non-rumbling body and silent mechanism are appreciated features of this Studebaker Street Car bus. The rear axle, and the transmission which has four speeds forward, were specially designed to meet the exacting demands of street car type service.



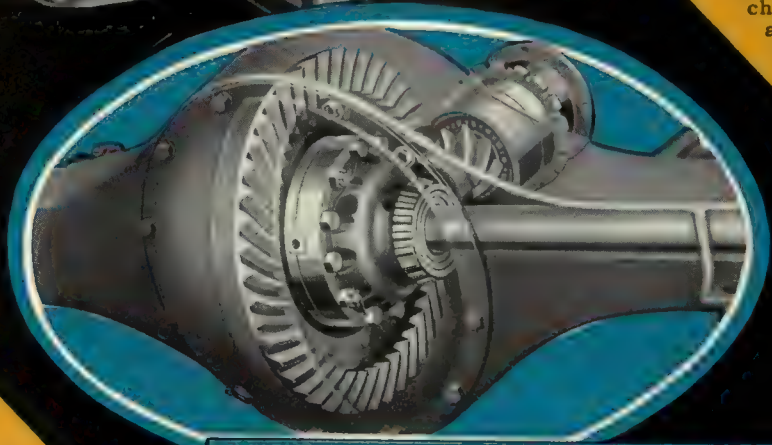
Heavy Duty Bus Chassis

Rugged Strength

*means lower operating cost and
longer service*

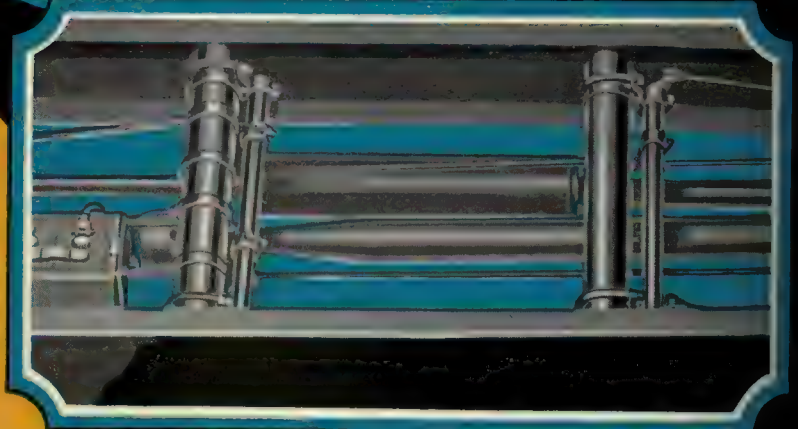


The Studebaker "75" motor, famous for its long life, develops ample power for the most difficult routes. Vibration is practically eliminated by a fully machined crankshaft and accurately balanced parts. The "75" is the most powerful bus chassis in the world of its size and weight.



Four-wheel brakes of giant strength give positive control. These brakes develop 1600 horsepower braking effort at 40 miles per hour. The servo action utilizes the rotating action of the wheel to increase the braking effect. 650 square inches of brake surface give one square inch to every 8.3 pounds of chassis weight.

The specially designed rear axle is built like a bridge for great truss strength. Oversize Timken bearings, large chrome molybdenum steel shafts, extra heavy gears and the box section, malleable housing offer safety factors for the heaviest service. Its large removable cover plate permits easy inspection or adjustment.



The rugged frame is braced with nine stout cross-members including two large tubular units. The three inch tubular propeller shaft is carried in heavy universals to insure perfect alignment and care-free performance. Note the clean cut design and heavy brake rods.

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this
coupon
for further
particulars

THE
STUDEBAKER
CORPORATION OF
AMERICA

Dept. B, South Bend, Ind.

We have busses at present.
Check below the Studebaker Bus
about which you desire information.

Type: Sedan Parlor Car Street-
Car Type Capacity: Pass.

Name

Address



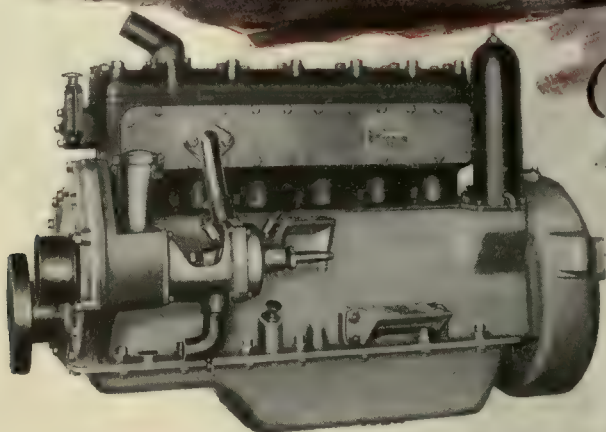
We slip 'em the grip!

Just let this hulk of a tire join hands with the slickest going—and it grabs 'hold like a long lost brother in the ancient order of "Get There." Keeps trucks up and earning! Those traction cogs pull through in mud—bottomless roads—loose sand.

Goodrich

FOR TRUCK TIRES

THE B. F. GOODRICH RUBBER COMPANY
AKRON, OHIO—In Canada: CANADIAN
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ONTARIO



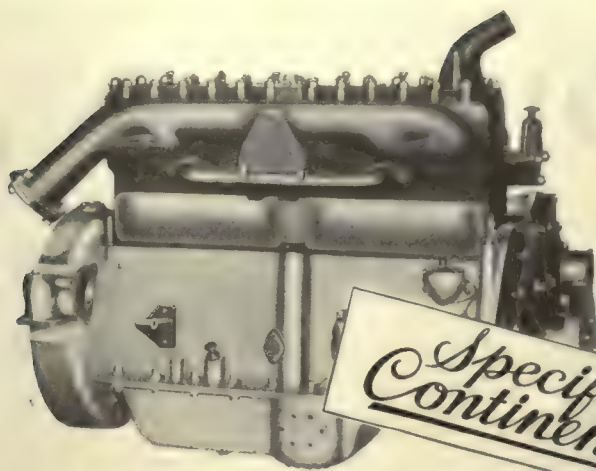
Where Minutes Count ~

A reputation for being on time is an asset to the bus operator. On the daily trips minutes count, schedules must be met, passengers satisfied. The bus equipped with a Red Seal Continental Motor brings profitable patronage because of its motor dependability through rough going or "easy sailing". Continental motors built for bus service, give an economy of performance essential to profitable operation. For more than a quarter of a century Continental executives have concentrated on the development of gasoline motors. Today, as a result of continuous high quality and an unrivaled organization of specialists developed through these years of experience, Red Seal Continental Motors have attained an outstanding position in the transportation field.



CONTINENTAL MOTORS CORPORATION
 Offices: Detroit, Mich., U. S. A. Factories: Detroit and Muskegon
 The Largest Exclusive Motor Manufacturer in the World

Continental Motors



*Specify
Continental*

ENDURANCE

The ability to stand up under the continuous hour after hour runs of daily use characterizes the motor bus powered with a Red Seal Continental Motor. Such endurance is a prime factor in attaining the long life so necessary to the profitable operation of the motor bus.

CONTINENTAL MOTORS CORPORATION

Offices: Detroit, Mich., U. S. A.

Factories: Detroit and Muskegon

The Largest Exclusive Motor Manufacturer
in the World



Continental Motors

Please Note This Fact

Operators of trucks and buses pay for Air Springs whether they use them or not.

That's why 89 Electric Railways operating 4270 buses and trucks, and thousands of other large fleet owners use Air Springs.



The CLEVELAND PNEUMATIC TOOL Co.
Cleveland, Ohio

GRÜSS
Sleeve Type
AIR SPRING



WESTINGHOUSE
Piston Type
AIR SPRING

THE SHOCK ELIMINATORS FOR TRUCKS-BUSES-PASSENGER CARS

800 BLACKHAWK JACKS

*Lift Load and All
for Pickwick*

For over 4 years more than 800 Blackhawk Jacks have been standard equipment on Pickwick Stages System. No one factor has contributed more to the rigid on-time schedule for which this line is noted.

The Blackhawk Motor Coach Jack (shown above) lifts seven tons easily. Tire changes require no disturbing of passengers or load — no "grief" to natty uniforms.

The Motor Coach Jack will handle the lowest front end. The hand-adjustable extension provides ample lift for high rear ends. Goes under ANY bus with flat tire. Lifts high enough for replacements.

The bayonet lock handle permits placing and withdrawal of the jack at long range as an easy, safe one-man job. No kneeling or crawling under bus, regardless of overhang or platform.

Short or long strokes lift the load. Lowering is automatic; operator controls the speed.

Details and prices of the complete line of Blackhawk Jacks (1½ to 60 tons capacity) gladly sent to any interested executive.

BLACKHAWK MFG. CO.

Dept. E.J.

Milwaukee, Wis.

BLACKHAWK JACKS

HYDRAULIC
OIL-POWER

The "Motorcoach" Jack
for busses and speed
delivery fleets.



This compact "Motortruck" Jack easily lifts any heavily loaded truck — an easy one-man job. One lift, without removing the load, pays for the Jack.



TWIN-CHEK Valve Unit automatically controls the hydraulic oil power. Located below the pump (outside the Jack), easily accessible.

Patented.



wobble and shimmy ...wobble and sh

THE snake dance of the wobbling tire takes the heart out of mileage—

And a lot of joy out of the gate receipts.

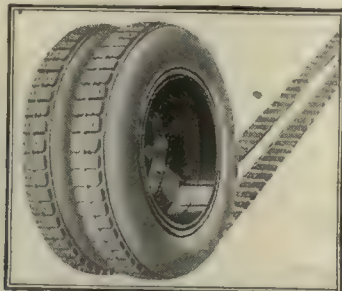
How can you get away from it? By making *sure* that you get Budd Duals!

Budd Duals have had the wobble licked from the start.

More than 100,000 buses and trucks have failed to get a wobble out of a Budd Dual.

That accounts for the phenomenal tire-mileages. The wheels are **TRUE**!

POSITIVE PERMANENT ALIGNMENT



GREATER TIRE MILEAGE

YOU GET FROM 15,000 TO 20,000 MILES from a set of tires on Budd Duals—

Because Budd Duals *always* run true as an arrow—

They can't get out of alignment to wobble and shimmy—

They have no demountable rims, no rim clamps—

So you can't get a tire on crooked.

This positive, *permanent* alignment is made possible by Budd Dual design.

BUDD

WHEEL COMPANY

Detroit



Versare Gasoline Electric Eight Wheeler for Montreal Traction Company.
This is equipped with Waukesha 120 horsepower Six Cylinder Engine

New Fageol
18-passenger
Parlor Car
equipped with
Waukesha
75 horsepower
Six Cylinder
Engine



Northland
Transportation Co.'s
C.H. Will Parlor Car
equipped with
Waukesha
100 horsepower
Six Cylinder
Engine

North Coast Lines
"Twin Coach"
City Service
Motor Bus
equipped with
Two Waukesha
50 horsepower
Six Cylinder
Engines



See the engines used in these unusual motor coaches
at our Exhibit, Space 606, A.E.R.A. Convention Hall

A-739-L

AUTOMOTIVE EQUIPMENT DIVISION

WAUKESHA MOTOR COMPANY
Waukesha (Eastern Sales Offices: Eight W. 40th St., New York City) Wisconsin

Exclusive Builders of Heavy Duty Automotive Type Engines for Over Twenty Years

You are invited

to inspect the exhibit

of

**CLARK
AXLES**

and

STEEL WHEELS

for

**Motor Buses
Trucks**

at the

Electric Railway
Association Convention

in

Cleveland

October 3 to 8, 1927

**CLARK EQUIPMENT CO.
BUCHANAN, MICHIGAN**

MEMBER MOTOR TRUCK INDUSTRIES, INC.



“Transportation Headquarters”

From one source of supply every requirement in the field of revenue-transportation can be met. American Car and Foundry and Affiliated Companies build for rail and road alike—passenger cars for steam roads, freight cars, gas-electric railcars, electric street cars and motor coaches.

At the 1927 A. E. R. A. Convention

A. C. F. exhibits will include the most comprehensive display of revenue-transportation equipment that has ever been shown by a single organization.

Interesting developments in the field of motor coach transportation will be shown by the American Car and Foundry Motors Company at Spaces 620-625. Your inspection is invited!

Greater Urban Revenue

—not merely Lower Costs—

makes Q.C.F. Coaches Profitable

Profit or loss in Urban Coach operation usually depends on whether you transport the discriminating marginal riders who choose between *your* coach and *their* private cars.

This important class cares little whether your coaches operate for a cent less or more per mile. Only fast, quiet, comfortable and conveniently scheduled coaches win their patronage.

With thirty years of experience manufacturing revenue-transportation equipment for rail and road alike, Q. C. F. builds coaches that win, hold and multiply the patronage of marginal riders. And Q. C. F. quality assures low operating costs.

In Q. C. F. urban types neither sleek, low appearance or adequate headroom is sacrificed. Note the wide door and extraordinary visibility. Many noted Utilities are operating Q. C. F. Urban Coaches on both Model L and Model M chassis.





For medium duty Model M, 198" wheelbase, is as profitable as the larger Model L in Mass Transportation.

NOTE how transportation experience is reflected in every detail of the Q. C. F. Urban Coach. Convenience and comfort attract and hold the marginal business, so that your profit need not depend on the mere shading of operating costs!

Minimum headroom is 76"! 40 cubic feet of air for every seated passenger—four large, effective ventilators assure a clear, inviting atmosphere even on wet days and in winter—permanently tight exhaust connections—wheel motion is applied to dissipate the exhaust fumes before they can enter the coach.

The deep-cushioned Brill seats, in genuine leather, are 35" wide, with more than ample leg room. Even the wheel-house seats are really comfortable.

The aisle is 20" wide at seat-backs—

standees do not slow up movement and schedules. At the front, 20 square feet of floor space and convenient fare-box arrangement speed up the loading. At the rear, 24 square feet of floor space entice standees rearwards!

The top of transom windows is 5' 6" from the floor; street signs are easily noted, avoiding the late rush to the door. The entrance door is 33" wide, facilitating loading and unloading *with comfort*.

Examine all these Q. C. F. features at the Convention. Convince yourself that universal Q. C. F. transportation knowledge brings superiorities to please the Transportation Department, just as the superiorities of the Hall-Scott powered Q. C. F. chassis appeal to your Mechanical Superintendent.

Cost Below 1¢ per Seat Mile —for Luxurious Transportation— Starts Profit on 7th Passenger

Including station expense, administration, and all other transportation charges, Q. C. C. coach miles seldom cost more than 25 cents. In interurban service scores of authentic records show all-in costs of but 20 cents per coach mile!

With 27 comfortable and saleable seats in the Q. C. C. Parlor Coach, profits begin when the 7th seat is sold. 14 occupied seats on all trips in-and-out has been the Q. C. C. average, month after month, on one 84-mile Michigan route.

Always the appearance of Q. C. C. coaches, and the physical and mental comfort they induce, develop the riding habit—and *consistent profit*. There need be no excessively light off-hour trips to eat up peak-load revenue.

Restful operation, fast schedules and on-time performance which build up revenue, result from the same Q. C. C. revenue-transportation experience and mechanical excellence which hold down costs.

Five Model L Q. C. C. Parlor Coaches are increasing the riding habit and revenue along the Detroit-Lansing route of the Peoples Motor Coach Company, subsidiary of the Detroit United Railways.





The medium size O.C.F. Model M Parlor Coach is beautifully proportioned and smart in every feature.



Showing the 16-passenger narrow body. A 21-passenger full-width body is also available.



Special equipment such as rail and awning further enhance O.C.F. Parlor Coaches.

Patented—Exclusively Q. C. F. —an Electric Railway Manager's Design— The Parlor Observation Coach

By means of a depressed aisle in the Observation Section ample headroom is achieved with minimum overall height. The baggage compartment provides curb level loading and nearly two cubic feet of baggage space per seated passenger.



Mr. George Newell, Resident Manager for Stone & Webster on the Pacific-Northwest Traction lines, conceived this coach. As a practical traction man he entrusted development to the only motor coach manufacturer actively producing revenue-equipment for both road and rail. Benefitting by Q. C. F. resources, this exclusive product is widely considered to have the greatest revenue-producing possibilities in coach history.

The appearance is irresistible. Baggage is no problem—it loads into the spacious, perfectly enclosed compartment *beneath* the observation section. This “mezzanine” is so attractive that the rear seats fill first, and in some cases an extra charge for these seventeen seats is possible. They are real observation

seats, above obstructions to vision, and above the level of road noises.

Never has there been such a combination of maximum passenger comfort and maximum revenue space. Surplus baggage space permits express-package service and mail contracts which are paying for all gas and oil on some operations.

The fully patented Parlor Observation Coach typifies Q. C. F. leadership in profitable motor coach transportation. From the *automotive* standpoint: Hall-Scott power, speed, acceleration, indomitable strength, low weight for the high endurance factor. From the *transportation* standpoint: superior ability to get the business.



The 90 h.p. Hall-Scott motor and the highly developed Q. C. C. Model M chassis assure the smoothest, flashiest performance ever known in a motor coach. High grade passenger car performance attracts high grade passenger car business, obtainable only by means of luxury coach service. High fare business is readily attracted, greatly increasing revenue without great increase in cost.

High-Fare Limited Express Service

—*Private Car Luxury and Performance*—

gets Profitable Revenue now Lost

Every city of about 75,000 population, and upwards, has its pay-enter parking stations, charging 25 cents, 35 cents, or even 50 cents for the privilege of letting a car stand idle in a vacant lot. Increasing thousands of motorists are paying a dollar or more including parking charges, to drive themselves to and from business. Daily, thousands of women go shopping at similar expense for private transportation. And the idea of "two cars to a family" is being energetically pushed It all hits directly at your revenue.

You can compete only by providing transportation as fast, as comfortable, as convenient and as exclusive as the best private cars provide. You can do it with the luxurious 21-passenger,

90 h.p. Q. C. C. Special. It justifies high fare through high quality, high power and high speed. Twenty-five cents a ride is easily obtainable for this genuine passenger car performance:

Acceleration 5 to 25 miles an hour in 12 seconds.

Speed capable of setting the pace in traffic.

Riding qualities that are characteristically Q. C. C.

Deceleration—4-wheel Bendix Brakes

The virile 90 h. p. Hall-Scott engine in this 21-passenger coach assures luxurious transportation which increases revenue and profit out of all proportion to costs. Business now entirely lost is yours, with profitable returns.

A.C.F. Hall-Scott Power

—the Quality Keynote of all A.C.F. Chassis—

for Every Revenue Purpose

The difference between merely *automotive* design and entirely *transportation* design is typified by the A.C.F. Hall-Scott engine. Free of the precedents of both truck and car practice, this engine is *maintained* like transportation power units of any other type. Unit assemblies can be interchanged, so that

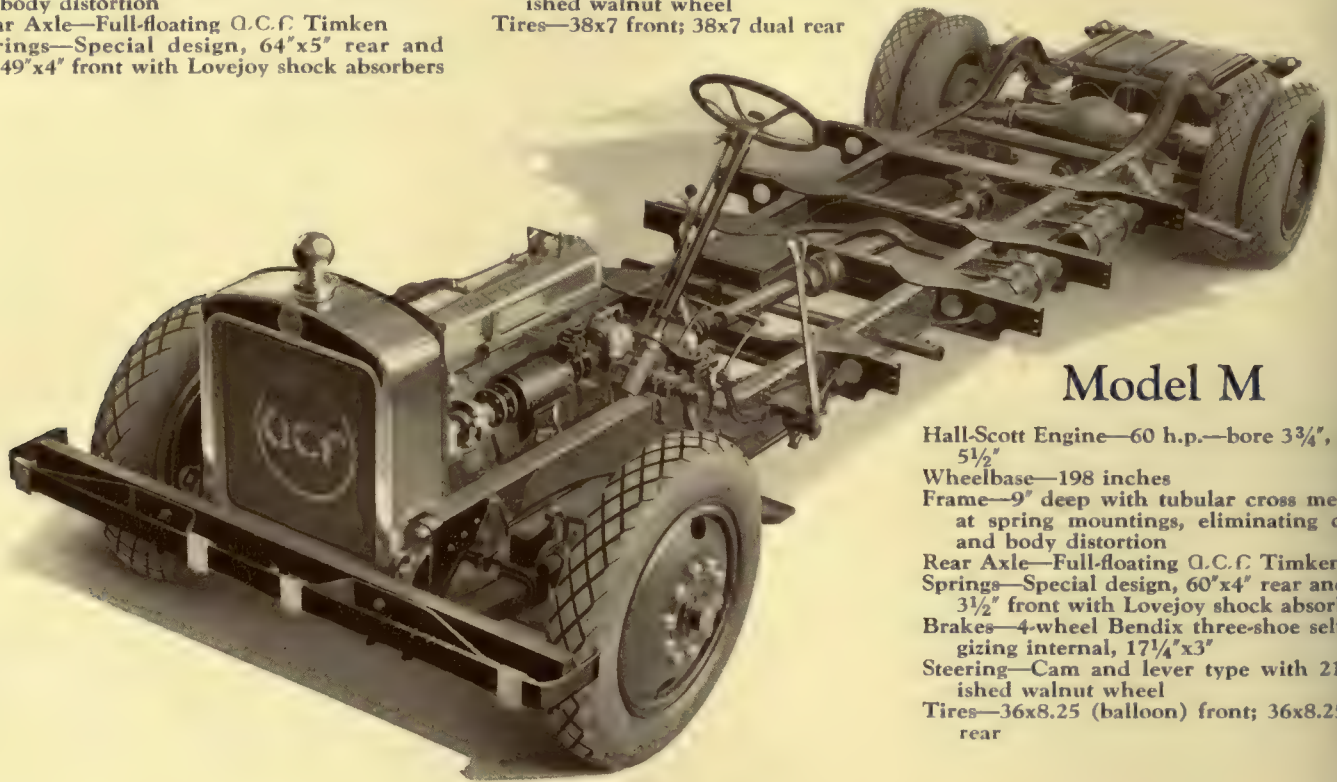
A.C.F. coaches stay on the road while shop work is in progress.

Every feature of every A.C.F. model is on a par with Hall-Scott superiority. There could be no stronger assurance of correct engineering for all revenue-transportation requirements.

Model L

Hall-Scott Engine—90 h.p.—bore $4\frac{1}{4}$ ", stroke $5\frac{1}{2}$ "
 Wheelbase—230 inches
 Frame—11" deep with tubular cross members at spring mountings, eliminating frame and body distortion
 Rear Axle—Full-floating A.C.F. Timken
 Springs—Special design, 64"x5" rear and 49"x4" front with Lovejoy shock absorbers

Brakes—Rear, Westinghouse internal metal-to-metal, air-operated, $16\frac{1}{2}$ "x6". Front, Bendix three-shoe self-energizing internal, $17\frac{1}{4}$ "x3"
 Steering—Cam and lever type with 21" polished walnut wheel
 Tires—38x7 front; 38x7 dual rear



Model M

Hall-Scott Engine—60 h.p.—bore $3\frac{3}{4}$ ", stroke $5\frac{1}{2}$ "
 Wheelbase—198 inches
 Frame—9" deep with tubular cross members at spring mountings, eliminating chassis and body distortion
 Rear Axle—Full-floating A.C.F. Timken
 Springs—Special design, 60"x4" rear and 46"x3½" front with Lovejoy shock absorbers
 Brakes—4-wheel Bendix three-shoe self-energizing internal, $17\frac{1}{4}$ "x3"
 Steering—Cam and lever type with 21" polished walnut wheel
 Tires—36x8.25 (balloon) front; 36x8.25 dual rear

A.C.F. Mechanical Drive Models

21-Passenger Urban Coach	30-Passenger Urban Coach	31-Passenger Urban Coach
16-20-Passenger Parlor Car	27-Passenger Parlor Car	60-Passenger Double Deck
	21-Passenger Express Special	(Fully Enclosed)

A.C.F. Gas-Electric Drive Models

30-Passenger Urban Coach	31-Passenger Urban Coach	60-Passenger Double Deck
		(Fully Enclosed)

AMERICAN CAR AND FOUNDRY MOTORS COMPANY

30 CHURCH STREET, NEW YORK

Spaces 620-625 A. E. R. A. Convention—Cleveland

Right from the start,
banishing the bugaboo
of Blowout, Breakdown
and Base Separation
has placed General's
Heavy Duty Cushion
line on a par with
its pneumatics



—better buy
Generals NOW
than buy and buy

The
GENERAL
TIRE

—goes a long way to make friends

BUILT IN AKRON, OHIO, BY THE GENERAL TIRE AND RUBBER CO

2 things worth saving

Protex Glass

is manufactured for us by the Mississippi Glass Company. It is a solid glass of great brilliancy with a plate glass finish, developed for the safety of drivers and passengers in motor vehicles.

Check these points!

- PROTEX will not shatter
- PROTEX will not discolor
- PROTEX will reduce injuries
- PROTEX will lower maintenance costs
- PROTEX will lower public liability insurance premiums
- PROTEX costs considerably less than any other motor protective glass on the market.

Write for samples and quotations. No obligation whatsoever.

Protex Glass for Safety

Weight per square foot approximately 3 lbs. *Sizes* up to 38" wide and 100" long. *Thickness* approximately 5/16". Steel wire 22 B. & S. Gauge deeply imbedded in the glass runs 2 inches apart *with the length*. In ordering always specify the height of window first.

Protex

GLASS

for
SAFETY

Protex Glass Company • 220 Fifth Avenue • New York

LIFE *and* MONEY

Flying glass presents the greatest danger to drivers and passengers in case of collision. One single tragedy may cost you more than permanent protection by means of PROTEX—the glass that cannot fly.

Not only is PROTEX by far the least expensive motor car protective glass on the market, but if you own five or more busses and pay over \$1,000 a year for public liability insurance, PROTEX glass, by decreasing your accidents, will earn you a lower premium under the Automobile Experience Rating Plan of the Old Line Insurance Companies. To save life and money equip with PROTEX now.

Visit the Protex Booth No. 529
at the
A.E.R.A. Convention in Cleveland

Protex

GLASS

for
SAFETY

Protex Glass Company . 220 Fifth Avenue . New York



Charles Goodyear,
from a
contemporary portrait

The Greatest

He walked the streets in downpouring rain in a strange garment of rubberized cloth.

He met the jeers of the world with a faith that neither disaster nor seeming disgrace could conquer.

He laid upon the altar of his work all the dear things of life—health, family, friends, fortune, happiness.

He was cast into prison for debt.

He felt himself "appointed of God."

He discovered the vulcanization of rubber

His name was Charles Goodyear.

IN the immense and farflung industrial structure that is Goodyear today, an army of workers labors to enlarge Charles Goodyear's discovery.

In cities that he never saw—quite possibly of which he could not even dream—and in an enterprise he did not found, his spirit abides where his name finds greatest honor.

With every passing year, the name of Goodyear rises higher, clearer.

Deservedly the greatest name in rubber in the beginning, through the work of the man, it is today no less deservedly the greatest name in rubber through the work of the institution which followed the path he pioneered.

The name Goodyear is greatest in invention.

Look through the annals of the rubber industry's achievements, and on every important page for a quarter-century you will find record of Goodyear the institution's contribution to the art.

Goodyear invented the present straight-side tire.

Goodyear perfected the principle of cord tire construction underlying the high-mileage performance of automobile tires today.

Goodyear ingenuity fashioned the machines necessary to the production of this new construction.

Goodyear devised the All-Weather Tread, for maximum safety, traction, wear.

Goodyear pioneered the successful pneumatic cord truck tire.

Goodyear originated the Plant Analysis Plan of specifying rubber mechanical goods to the uses of industry.

Goodyear provided the indispensable rubber equipment for aeronautics in America, and itself established record after record in air navigation.

Goodyear developed SUPERTWIST, the extra-elastic, extra-durable cord fabric essential to the modern low-pressure tire.

Goodyear has just now announced the tractive, slow-wearing new Goodyear balloon tire with the new-type All-Weather Tread.

The name Goodyear is greatest in sales.

The measure of value in rubber may accurately be gauged by volume of sales, sustained public demand being the evidence of merit.

More people ride on Goodyear Tires than on any other kind.

More people walk on Goodyear rubber heels than on any other kind.

More Goodyear rubber conveyor belting is used in industry than any other kind.

More Goodyear rubber equipment is supplied to commercial aviation and for national aeronautical defense than any other kind.

Name in Rubber

More Goodyear Tires—many millions more—have been made and placed in the service of motorists than any other kind.

More rubber is used by Goodyear—nearly one-seventh of all the crude rubber produced annually on the earth, almost 50% more than is used by any other manufacturer.

The name Goodyear is greatest in service.

There is in the Goodyear business method a fixed principle of the greatest service to the greatest number.

With the same care that it builds into its products the greatest possible value, Goodyear has provided the means to help users get all that value out.

It has covered the world with a network of branches, depots and dealer service stations for the prompt supply and expert servicing of Goodyear wares.

It has pledged its selected retail outlets to give the skilled assistance to owners that results in the enjoyment of the last ounce of usefulness built into the Goodyear product.

The name Goodyear is greatest in usefulness.

It is a fair statement to say that none of Goodyear's success has come to Goodyear unearned.

This is a young company—eager, alert, forward-looking—one of the youngest although it is the greatest rubber company of the world.

It has come along no royal road in its march to decisive leadership, but often through trial and travail like that which Charles Goodyear himself endured.

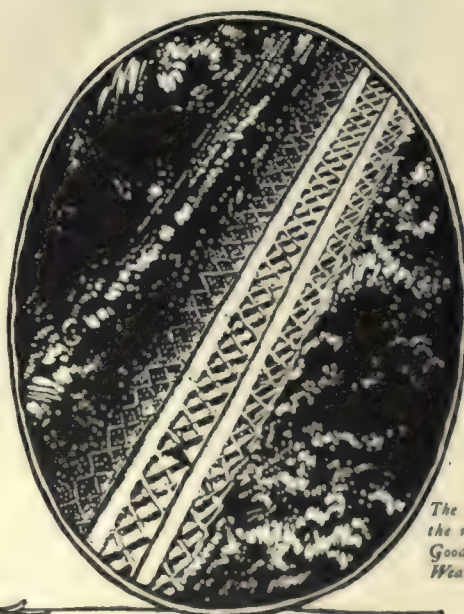
But it has had his conquering spirit in its heart. And it has had the devoted service of thousands on thousands of loyal men who respond to that spirit.

And it has had the trust and good-will of the millions of people who have tested its work and word and found them worthy.

It will keep all these, because it knows whereof they spring.

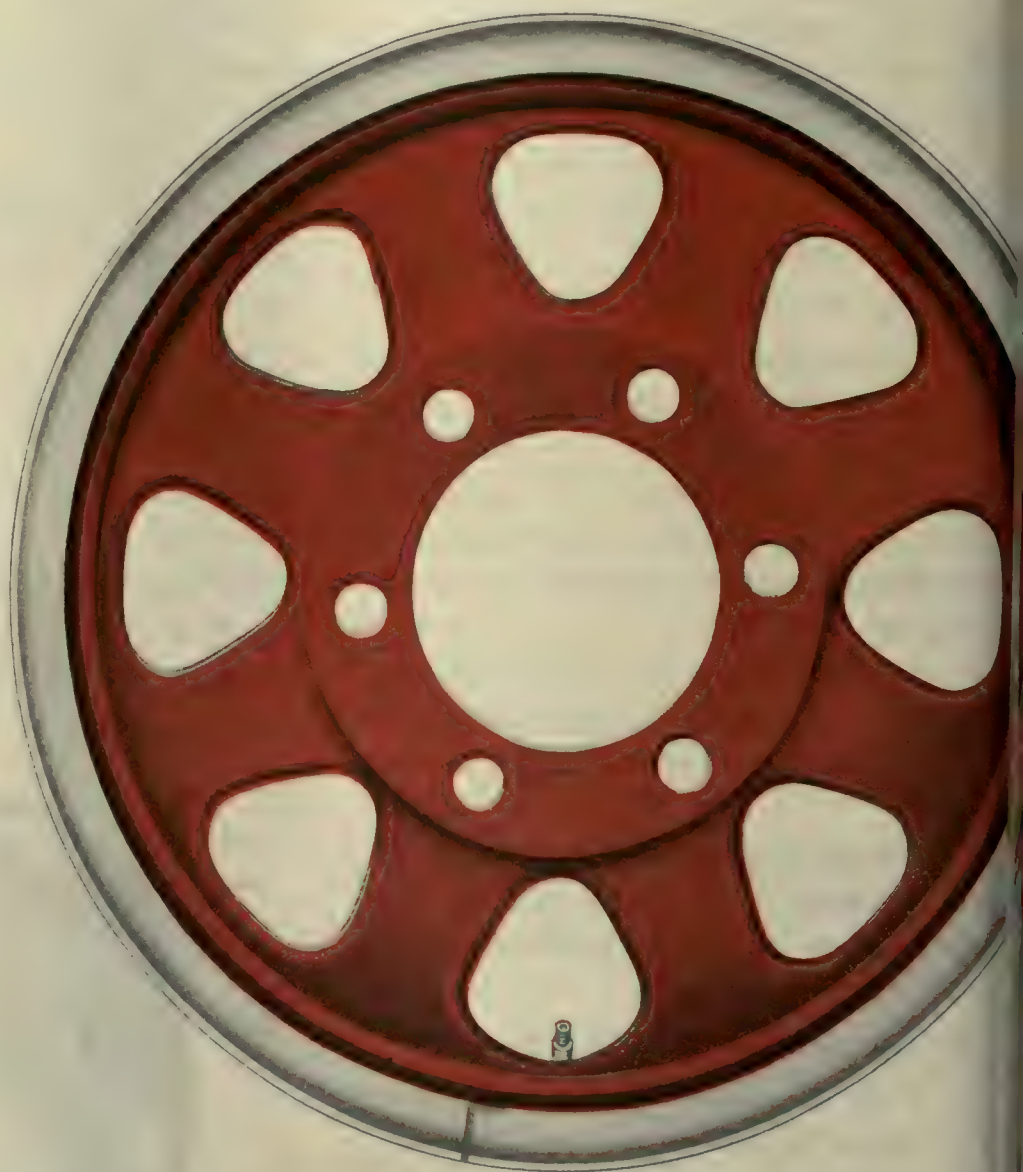
In the beginning, by force of discovery, Goodyear was the greatest name in rubber.

By force of usefulness, to its own and to all people, Goodyear is the greatest name in rubber today.



The imprint of the new-type Goodyear All-Weather Tread





Moto

Spoksteel

MAKE a note—Space 492—see the furthest progress in bus wheels, sponsored by the world's largest wheel manufacturers.

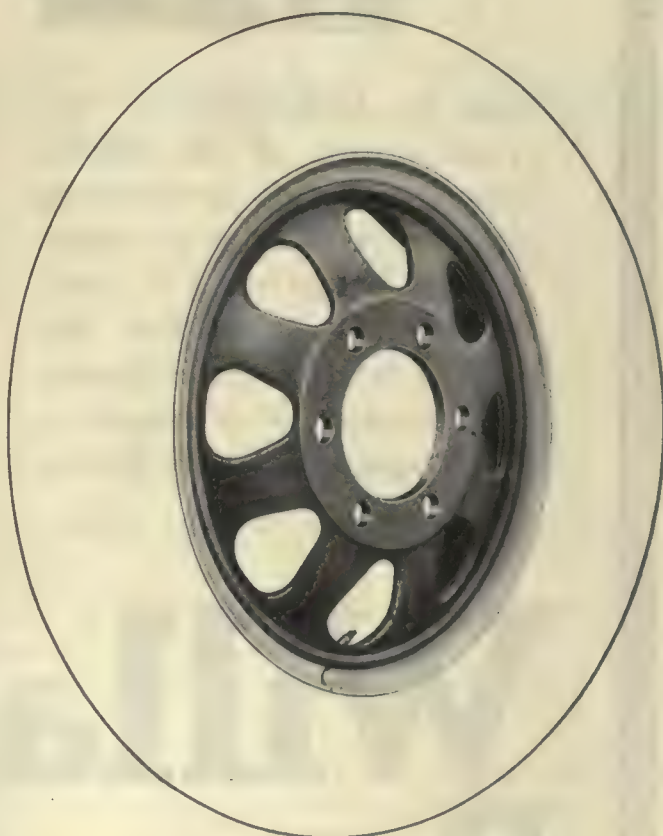
The Spoksteel combination of high-carbon forged steel and spoke-type design adds strength, saves weight, improves cooling, cuts maintenance and makes for silence.

In dual and single operation, the Spoksteel wheel and its mounting assure by far the finest service and the lowest wheel and tire costs ever known to the industry.

Spoksteel advantages are so broad and clean-cut that a few moments at Space 492 will give you overwhelming evidence.

MOTOR WHEEL CORPORATION
LANSING · MICHIGAN
World's Largest Wheel Manufacturers

SPACE 492
 A · E · R · A
 CONVENTION
 CLEVELAND



*Interchangeable on Hubs
 for Dual Steel Wheels*

Wheel

Every Bus On Time Every Day



Note the baffle plate in the cross-section of the filling plug — and the condensing chamber just above it. Spray caused by gassing is condensed and returned to the battery. So there is less chance of corrosion of terminals — less frequent need for filling.

WILLARD STORAGE BATTERY COMPANY
CLEVELAND, OHIO

Every delay has a small beginning. It may be a faulty or wrongly designed filling plug, which has allowed escape of solution and caused corrosion of battery terminals. Depend on Willard filling plugs to do their part -- and help Willard Bus Batteries give the uninterrupted service you need to have every bus on time every day.

F.A. Willard

Willard Batteries



A Lang all-metal body



—a sturdy body which combines low weight and low maintenance with utmost attractiveness—whose quick, easy servicing will appeal strongly to its operator. And it is luxurious even for city service.

Lang is ever alert to develop new ideas in bus construction. Lang is in a position to do these things. Lang craftsmen know the inherent needs of Steel body construction as applied to railway and motor bus service.

And then, too, we find the latest type automatic treadle door in the rear—fully interlocked with the brakes—an achievement in rapid bus passenger interchange with a circulating load. Clear vision front, narrow steel frames, easily replaced panels, single raise sash—pleasing interior and exterior lines.

Assuredly Lang brings to bus operators every means whereby new business can be created and held.



LANG BODIES

create new passengers



LANG interprets better transportation to the *operator* through a sturdier body construction whereby maintenance is lowered and passenger miles increased.

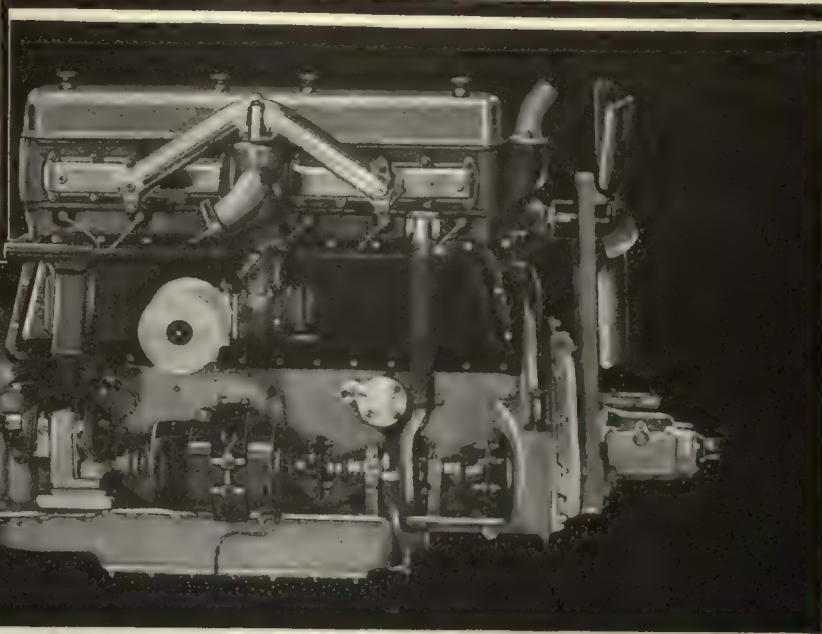
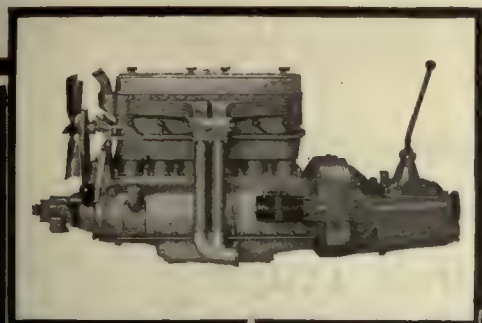
To the *passenger*, better transportation means a greater comfort gained by Lang through a judicious planning of every detail essential to passenger convenience.

In Lang bodies this two-fold interpretation of better transportation finds its highest achievement. Beneath their element-defying exterior is in-built, added-mile Lang craftsmanship. Whether in the hands of fleet owners or the operators of one or two buses, these Lang qualities mean consistently greater profits.

THE LANG BODY COMPANY, CLEVELAND, OHIO

*"After all—
it's the Setting
that counts!"*





White Six Cylinder 100 Horsepower Motor

THE White Six Bus Chassis is powered by a six-cylinder, 100 horsepower White engine, which combines smoothness, abundance of power, quietness and flexibility of operation at all speeds and loads, with ruggedness, simplicity and accessibility.

7 Bearing Crankshaft—

Gives smooth operation and long bearing life.

Overhead Valves—

Give maximum pulling power and gasoline mileage with minimum maintenance expense.

Full Pressure Oiling—

All working parts oiled under pressure with clean oil.

Induction System—

Mixture temperature controlled from dash, giving quick warming up and proper carburetion and best gas mileage all the year around.

Double Ignition—

Two sparks per cylinder, electrically synchronized, and yet able to function independently.

Salt Cooled Exhaust Valves—

No warping or burning. Approximately twice the service of the conventional valve, without regrinding.

Ejector Type Exhaust—

Lowest back pressure and best cylinder scavenging.

Accessibility—

All parts readily accessible for inspection or adjustment.

SEE THE WHITE TRUCK AND BUS EXHIBIT AT THE A. E. R. A. CONVENTION

THE WHITE COMPANY, *Cleveland*

WHITE BUSES

FOURS AND SIXES

Ten years ago

TEN YEARS ago a group of men visioned the possibilities of six-wheel vehicles. Their initial effort was a Six-Wheel Truck—which carried loads of five tons and upwards from coast to coast over a million miles of city streets and country roads.

Many other Six-Wheel Vehicles were built and tested by these pioneers during succeeding years, until the design fulfilled their ideals—the design that today insures:

Greater riding comfort.

Increased Safety by means of brakes on four rear wheels; standardized use of air brakes; freedom from skids; wider and lower frames and axles.

Faster Travel with six-cylinder engines and pneumatic tires.

Greater luxury and security by reason of well designed bodies, seats and interior decorations.

These obvious advantages of Six-Wheel Vehicles have overcome all opposition, so that today they are generally accepted not only in the United States but the world over.

See the latest

SAFEWAY

Six-Wheel Models

Spaces 600-601

and Today

FROM Zurich to Julier Neck in the snow covered Alps at an altitude of 7500 feet—from Beyrout to Bagdad over a 600 mile route through the blistering heat of the Syrian Desert—Safeway Six-Wheelers maintain their regular schedules.

Between Paris and Deauville the six-wheel “Les Fleches Bleues” maintains the most luxurious and exclusive motor coach service.

Anywhere, everywhere throughout the world six-wheel vehicles have been adopted—by the Soviet Government in Russia, by the United States Quartermaster Corps, by a subsidy act of the British Government.

England—France—Germany—Switzerland—Holland—Argentina—Brazil—South Africa—Australia—India—Canada—United States—all ride on six-wheel vehicles.

Cleveland operates 60 Safeway Six-Wheelers—Akron has 37—Detroit has 140. Kansas City, Pittsburgh, Cincinnati are other typical Safeway Six-Wheeler cities.

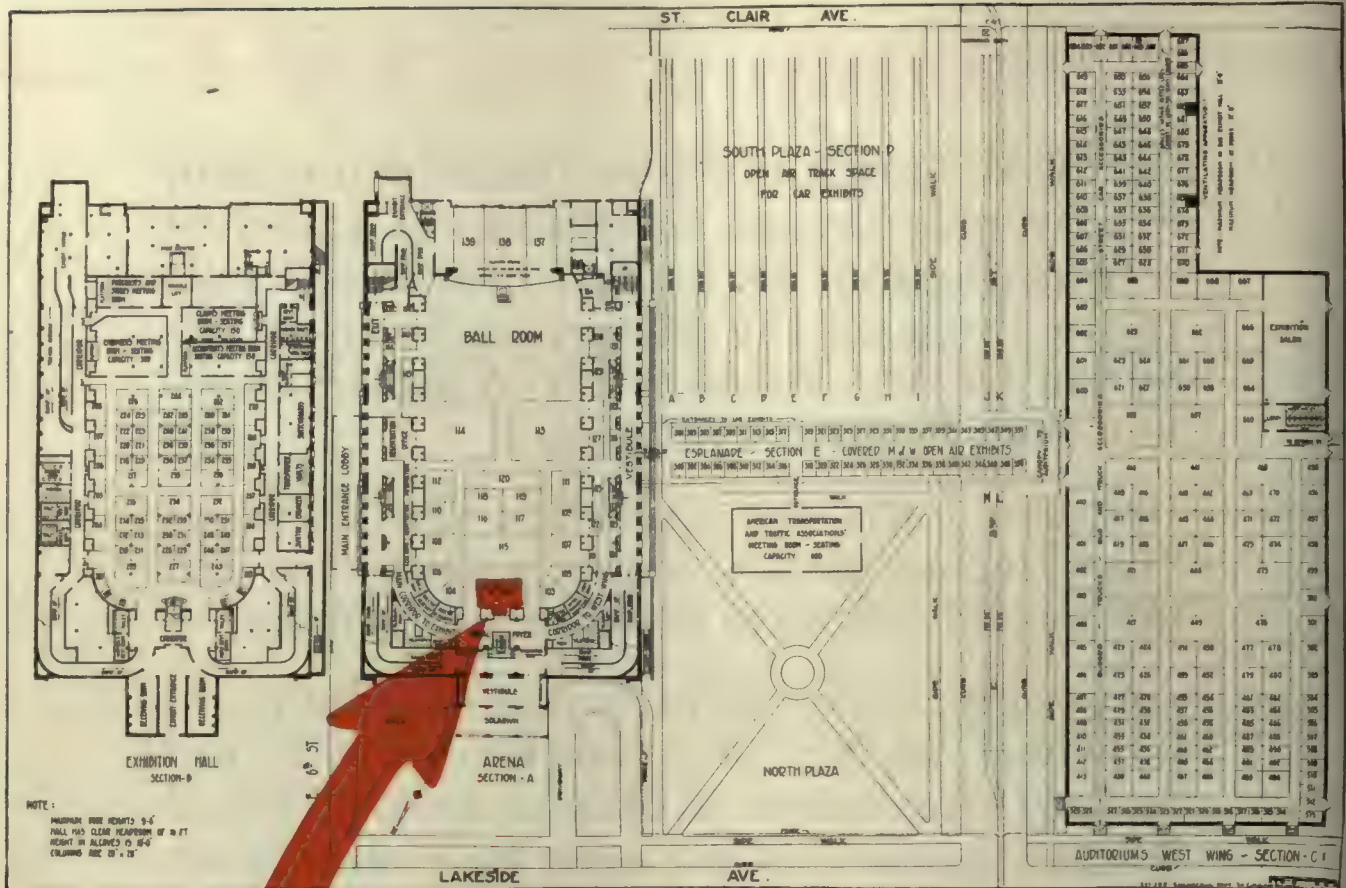
Truly the vision of ten years ago has become a reality—a permanent part of modern transportation.

The organization which pioneered the Safeway Six-Wheel Coach gratefully acknowledges the endorsement and tribute of the world's leaders of transportation.

THE SAFEWAY SIX-WHEELER

THE SIX WHEEL COMPANY, 1800 W. LEHIGH AVENUE, PHILADELPHIA, PA.

Manufacturers of De Luxe, City, and Double Deck Type Six-Wheel Coaches



ELECTRIC RAILWAY JOURNAL

Headquarters
Spaces

101-102

Just inside the main door!
Just as easy to find as ever.
Drop in! We're here to
serve.

INDESTRUCTO

non-shatter

PLATE GLASS



FIRST, in adding to the safety of passengers . . . and also in reducing liability insurance premiums and thereby cutting initial costs, *Indestructo* comes increasingly into prominence in the motor-coach field.

Such an item should be of vital interest to you!
Write for detailed information and quotations.

*also PLATE GLASS unusually qualified to
meet the strict demands of motor-coaches . . .
glass of suitable thickness and of better quality
than ordinary plate glass . . . at no higher cost!*

M. RAWLE CO., INC.

210-212 WEST SIXTY-FIFTH STREET
NEW YORK CITY

There's a

HASKELITE

in up-to-date Buses for

Double Deck Buses



The Philadelphia Rapid Transit Company operates 205 of the double-deck buses manufactured by the Yellow Truck & Coach Manufacturing Company with HASKELITE half roofs on the upper deck and HASKELITE $\frac{5}{8}$ -in. floors on the upper deck.

Street Car Buses

Scranton Railways has 9 street car type buses manufactured by the American Car and Foundry Motors Company. HASKELITE roofs and PLYMETL side panels are standard construction in these buses.



The unequalled strength of HASKELITE and PLYMETL, coupled with their light weight recommend them to every builder and operator seeking rugged, dependable construction, long life and low operating cost.



Haskelite Manual

133 W. Washington St.
Railway

Economy Electric Devices Co., 37 W. Van Buren St., Chicago

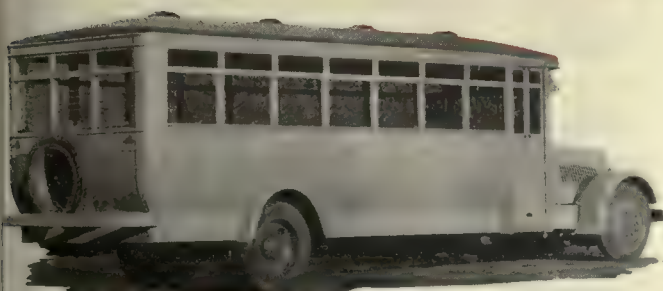
Railway & Power Engineering Co.

Place for PLYMETL all Types of Service Twin Coaches

The Chicago Surface Lines are operating 5 of these new Twin Coaches. These buses have PLYMETL panels and interior lining, HASKELITE floors and roofs. The single piece roof is 24-ft. long by 42-in. wide.



City Type Buses



Public Service Company of New Jersey has 231 Mack City Type Buses of 29-passenger capacity built by International Motors. HASKELITE roofs have long been standard on these buses.

HASKELITE and PLYMETL are standard construction with the leading bus builders of the country. They are specified by big operators who study service and costs closely. May we send you a full list of users?

ing Corporation

Chicago, Illinois
Representatives:



Grayson Bros., 600 La Salle Bldg., St. Louis, Mo.

Chicago, Ont., Canada



Illustrating the Karpen Standard Double Bus Seat without "wall" arm

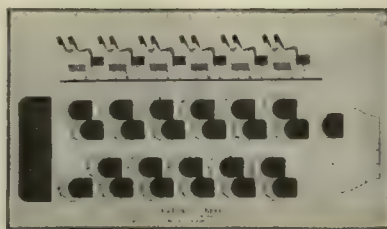
Visit the Karpen Exhibit at Cleveland October 1st to 7th

In the rapid transition of the motor bus from the short-distance commonplace type to the long-distance de luxe style, better seating can be credited in a large degree.

The vast resources of the Karpen shops made possible experimental work which has been productive of amazing improvements in bus seat comfort and endurance. New features developed within recent months will be ex-

hibited at the Cleveland convention. Every man interested in bus equipment will find it an important showing.

In addition to the conventional fiber and city service bus seats, and the popular Karpen "Staggard" seat, the exhibit will include the new Karpen Club seat, the high back head-roll seats for long distance, the adjustable reclining seats and the new Karpen driver's seat.



Karpen Artfibre colors are dyed in the fiber before it is spun and woven.

Karpen

FURNITURE

S. KARPEN & BROS.

General Offices, 636-678 West 22nd Street

CHICAGO

San Francisco Salesroom

180 New Montgomery Street

Steel tubing frames and wire filled up-rights make Karpen fiber seats wear-resisting.

New York Salesroom
37th Street and Broadway

Chicago Salesroom
801-811 So. Wabash Avenue

Everything

**a
motor coach
should be
or have --**



Graham Brothers 21-Passenger Street car type motor coaches—in the hands of operators from coast to coast—continue to prove the many operating advantages of the medium capacity coach Operating economy More frequent service Fine appearance Comfort Speed and Safety.

SEE THEM AT THE CLEVELAND SHOW

GRAHAM MOTOR

**Cylinder
Engine**

**Speed
Transmission**

Wheel Brakes
(Lockheed Hydraulic)

These new features—and 3-stage progressive type springs—make Graham Brothers Motor Coaches the most modern coaches built.

Power is increased. So is speed. And the new 4-speed transmission and 4-wheel brakes make possible the utmost use of the added power and speed with increased smoothness and safety.

The new spring construction is assurance of exceeding comfort.

Numerous other advanced features of design and construction result in even greater op-

erating economy and passenger satisfaction.

Always attractive within and without, always dependable, always low in first cost and operating cost—Graham Brothers 21-Passenger street car type motor coaches now set a new value standard. The complete coach f. o. b. Detroit is

\$4060

**BROTHERS
COACHES**

-and for **DELUXE SERVICE**



6 CYLINDER PARLOR COACHES

\$4045

**12-PASSENGER
PARLOR COACH**

(f. o. b. Detroit)

\$4290

**16-PASSENGER
PARLOR COACH**

(f. o. b. Detroit)

OPERATORS who are meeting the growing demand for a deluxe motor coach service with Graham Brothers Parlor Coaches are increasing their business and finding a new source of profit.

These new coaches—in 12 and 16-passenger types—are ideal units for fast city routes. They can parallel other lines of transportation without being competitive because patrons are glad to pay higher fares for this class of service.

With the improvements these parlor coaches are ideal for intercity service—high speed, ample power, positive brake and comfortable riding qualities. And their size and economy permit the more frequent service so necessary to obtain and retain patronage.

Only great volume production makes possible such low prices.

GRAHAM BROTHERS

EVANSVILLE — DETROIT — STOCKTON

A DIVISION OF DODGE BROTHERS, INC.
GRAHAM BROTHERS (CANADA) LIMITED, TORONTO, ONTARIO

When records show that a certain *bus* manifests a knack for attracting a greater number of passengers --
--when the same records show a strange absence of maintenance expense and "time out" on the *body* of that bus

then, more than likely

It's a Fitzjohn

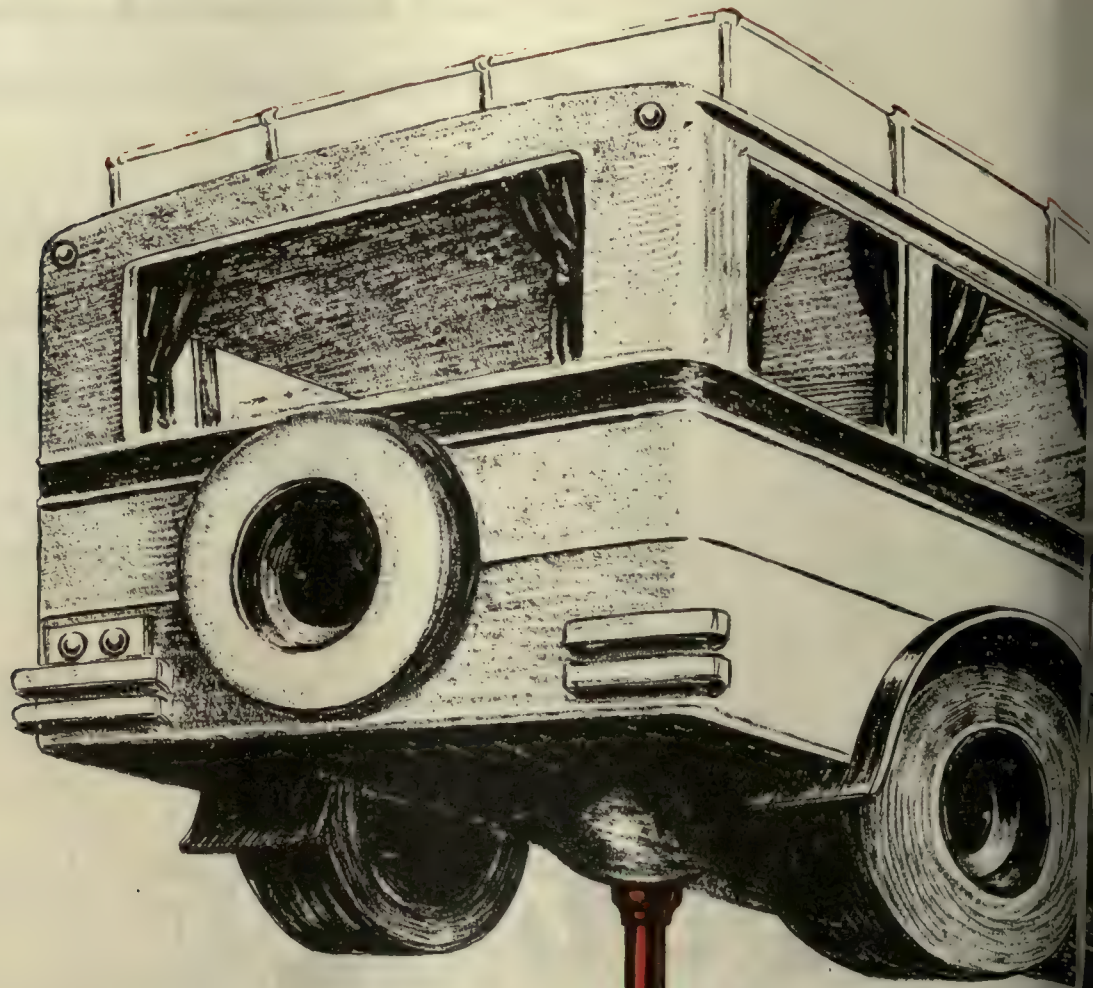
*because it's beautifully designed
for enduring strength*



Fitzjohn Manufacturing Co.
Exclusive Bus Body Builders
Muskegon, Mich.

Visit our Exhibit at Cleveland where we will show our new type 12-passenger parlor coach and 21-passenger parlor coach and pay-enter types. You will be cordially welcome at Booth Nos. 404, 405, 406

Let the "Oiljack



**A.E.R.A.
Convention
Booth
No. 512**

The

lift the load!

Think of the savings that can be effected through the use of "Oiljack"—the hydraulic type jack!

With the Pederson "Oiljack" any load within the limit of the jack's capacity can be raised with little effort—steadily, smoothly and quickly. It also lowers the load without jar or shock and can be instantly stopped at any position.

The speed with which it *safely* lifts or *safely* lowers a bus or light-weight street car means worthwhile savings in operators' and mechanics' valuable time. Think, too, of the effect such time-saving has on schedules—and the passenger good-will created by cutting down hold-ups on the road.

And the safety feature is one of its strongest advantages. There is *absolutely* no chance of the bus or street car dropping. The oil *cannot leak!* It is the absolutely perfect hydraulic jack built for long useful life.

See our exhibit at the A.E.R.A.
Convention, or write to us for full
particulars.



OIL JACK COMPANY, Inc.
15 Park Row, New York City



Another 12 Million added to the millions already riding on Miller Tires

FOR 8 years the Cleveland Railway has been buying Miller Commercial Tires exclusively for its trucks and automobiles.

Thus—in the operation of passenger buses—it was only natural after thorough tests and experiments with several makes that they should turn for service, safety, certainty and economy to the tires which, through years of use, have ably demonstrated these vital qualities.

Miller went through the hard experimental grind that a tire must go through to prove its right to carry millions to their destinations with safety and train-like regularity.

Miller “came through” with flying colors. And now—on over one hundred buses, about half of which are double deck type—Miller tires are proving daily the wisdom of this selection by the Cleveland Railway.

Gruelling service! Service in which there can be no slightest compromise with quality. Service that cannot tolerate delays. It's a job Miller is proud to do. A job Miller will—and can—do for any company seeking the same definite assurance of tire satisfaction at minimum cost. Write, wire or phone your Miller dealer for more evidence like this.



THE MILLER RUBBER COMPANY

of N. Y.

AKRON, OHIO, U. S. A.

YELLOWSTONE PARK TRANSPORTATION CO.



Ordiner, Montana.
August 19th, 1927.

Ahlberg Bearing Company,
14 So. 13th St.,
Minneapolis, Minn.

Attention R. H. Kelly

Dear Sir:

Replying to your letter of June 13th requesting information as to my opinion and any criticisms I might have on the service of the Ahlberg Ground Bearings, I am very glad to advise that I am entirely satisfied with the service rendered, especially by the Minneapolis Branch to whom we have been sending bearings for regrounding for several years. In fact, we have been using Ahlberg reground bearings associated with the Yellowstone Park Transportation Company, and it is my opinion that a bearing reground the "Ahlberg Way" is as good as a new bearing.

My opinion is based on the fact that bearings manufactured from case hardened material are never reground by your Company and any high grade ball bearing that has gone through service is tried and tested, thereby eliminating the possibility of developing cracks or flaws as is sometimes the case after the installation of a new bearing.

Incumbent, as they are absolutely dependable and taking into consideration also the worthwhile saving in cost, I certainly believe the habitual use of Ahlberg Ground Bearings is essential to the economical operation of a large fleet.

Yours very truly,

F. E. Hammersey
Superintendent

F. E. Hammersey SR-R

The view above shows the great fleet which carries the tourists of Yellowstone Park. Ahlberg Ground Bearings (Service Proven) make the maintenance of this fleet unusually economical.

The Real Test—

The real test is service—proven through years of experience. So we point with pride to the story of the Great Fleet of the Yellowstone Park Transportation Co. Since 1919 Ahlberg Ground Bearings have lent their dependability and their economy to the maintenance of this great army of *hard-used* cars and buses. The Superintendent, in his letter, puts his finger on the big advantage—"a bearing that has gone through service and then been re-ground, has been tried and tested by *actual service* and there is not the possibility of developing flaws and cracks—"

Then, too, there is a great saving * * * proven by figures we will be happy to send you.

For complete information, catalogs, price lists and quotations, address our Chicago Office or the Branch nearest you.

AHLBERG BEARING COMPANY

321 East 29th St., Chicago, Ill.

BRANCHES

Akron, Ohio	Columbus, O.	Milwaukee, Wis.	Providence, R. I.
Atlanta, Ga.	Dallas, Texas	Minneapolis, Minn.	San Francisco, Calif.
Baltimore, Md.	Denver, Colo.	New Orleans, La.	Seattle, Washington
Boston, Mass.	Detroit, Mich.	New York, N. Y.	St. Louis, Missouri
Brooklyn, N. Y.	Duluth, Minn.	Omaha, Nebraska	St. Paul, Minnesota
Chicago, Ill.	Kansas City, Mo.	Philadelphia, Pa.	Toledo, Ohio
Cincinnati, O.	Los Angeles, Cal.	Pittsburgh, Pa.	Washington, D. C.
Cleveland, O.	Memphis, Tenn.	Portland, Oregon	Youngstown, Ohio

Ahlberg

Ground Bearings

SERVICE PROVEN



Intemark makes
Ahlberg Ground

Bender Bodies for Style.



*The wash room.
Neat, Compact,
Complete.*



*Interior view.
Note spaciousness (yet
no space wasted), and wide windows
providing for unobstructed view.*

BENDER

Comfort and Quality

CONSIDER the Bender Body shown on the left. Note the grace, the balance and symmetry in spite of its spacious size. That's style.

Note the deep lounging seats, the wide, non-rattling windows, the observation bay in rear, the roominess—suggesting ease and rest. That's comfort.

Bender Bodies provide maximum luxury and comfort, and rival the finest that can be produced in coach work at a minimum cost.

Lighting, heating, ventilation and load balance are given special attention by our engineers. Years and years of body-building experience are back of every move we make. Materials and workmanship always of the best. That's quality.

Visit us at the AERA Convention.
Spaces 669 · 670 · 671 · 672 · 673

THE BENDER BODY COMPANY
W. 62nd and Dennison, Cleveland, Ohio

BODIES



FISK

Motor Coach Balloon TIRE

*With the Fisk
Multi-Cable Bead*

One of the greatest factors in the success of this Fisk Motor Coach Balloon Tire is its multi-cable bead. ORIGINAL WITH FISK

ANY large volume of hard rubber in the bead is subject to softening under the excessive heat which service induces and which creates a tendency to the working of the bead and consequent blowouts.

The construction of the Fisk multi-cable bead does away with this volume of hard rubber and insures much greater strength and flexibility with a longer term of wear.

Several small cables of high tension steel wire produce throughout the bead of the tire a more even distribution of all strains and stresses to which road and load conditions subject it than is possible in beads of other types.

The "Fillerless" Cord Construction (a Fisk patented process) and the heat resisting tread are also features adding to the service qualities of Fisk Motor Coach Balloon Tires.

THE FISK TIRE COMPANY, Inc.
Chicopee Falls, Mass.

FISK



Rider Appeal



GURNEY'S COACH 1829
WAS IN REGULAR OPERATION
BETWEEN LONDON AND BATH
ENGLAND. TRAVELING AT
15 MILES PER HOUR.

by
FRANK R. FAGEOL

THEY tell the bus and trolley men to merchandise.

After all, what is merchandising, if it isn't buyer appeal?

But in the bus and trolley field we are selling riders—so buyer appeal ought to be rider appeal.

Trying this logic out on myself: What if we tried to sell you coaches like the one above? You would smother a guffaw and say, "Why, the people wouldn't ride in that!"

No rider appeal!

The public, as Charley Gordon, Editor of Electric Railway Journal says, isn't buying cotton goods any longer. They want silk. Present day rider urge isn't being inherited

from parents who rode in a horse car. Today they look for a whiffletree in the botanical garden.

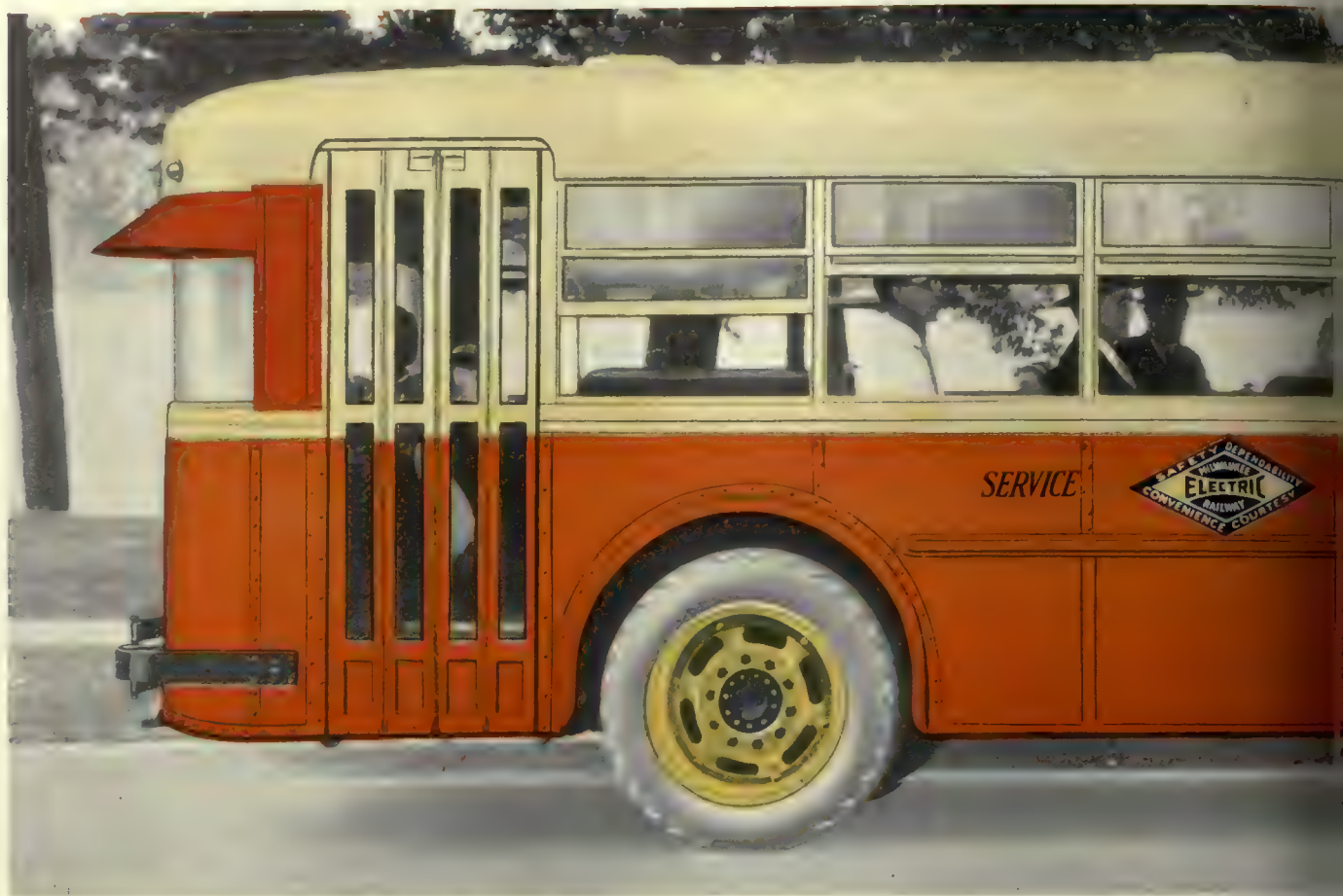
The Street Car is a great utility, but if you want to realize what happens to the fellow who just continues to furnish utility service without rider appeal, take a look at the automobile field. Class transportation is here.

If you don't believe our new Twin Coach has rider appeal ask the traffic officers in any city where the coaches are operating.

Illustration from
"The Motorcar and Its Story"
By Chas. R. Gibson—
Courtesy J. B. Lippincott Co.
Philadelphia.



TWIN COACHES



On September first The Milwaukee Electric Railway & Light C

HERE is the answer to the automobile's challenge to street cars.

It is built by Frank R. Fageol with the single thought of furnishing the traction operator an effective business weapon with which to meet automobile competition.

Capacity—the long sought for characteristic in motor coach design is here—not through impractical double-decking; not through unwieldy wheel base; not through a freak and uncomfortable seating arrangement and not by adding weight to the vehicle.

Street car capacity is achieved with riding qualities which bring ejaculations of surprise from every new load of patrons.

This is not mere sales enthusiasm: The Chicago Surface Lines' Twin Coaches are carrying on a Diversey Avenue feeder line from 90 to 100 passengers at a time.

The Milwaukee Electric Railway's experience is

available to everyone—the photographic proof from Milwaukee newspapers is to be had for the asking.

One of the best known men in the railway field who drives the most expensive motor cars, has ordered a Twin Coach especially equipped for long distance touring. That is rider appeal!

Rider appeal and street car capacity in a motor coach with 30% less weight per seat and depreciation-defying body, built integral with the frame, calls for immediate investigation.

Every wide-awake traction or steam operator owes it to his property to know whether the statements made here are legitimate. Made by Frank R. Fageol, father of most of the forward steps in the bus industry, they strike a note of caution to every prospective buyer of the present conventional coach design. What Frank R. Fageol's famous Safety Coach did to revolutionize coach travel the Twin Coach bids fair to do.



TO MILWAUKEE!



added the latest advance in coach equipment by Frank R. Fageol.

EVERY automotive superintendent should be keenly interested in reporting to his superiors on this newest development.

Notice the load arrangement and balance, heretofore unknown in a motor coach because of old time habit in locating the power plant; consider the complete interchangeability of parts; that rear axle without a differential and weighing a quarter of a ton less; brakes which can be relined without disturbing the wheel bearings; that amazing body idea; and the twin six-cylinder engines giving a maximum of power but thereby reducing the strain and cost of its application throughout the entire vehicle—lessening upkeep in a truly practical manner.

You superintendents of coach traffic *know* the public already is looking for greater lounging room. It wants leg room, elbow room, head room, parcel room, greater cubic air space and the mechanical quiet of the private enclosed car.

You can read with perfect ease in the back seat

of a Twin Coach. You can get in and out without a dent in your hat. Head room: 6 ft. 5 in.

That is what is meant by rider appeal. Peculiar way to say it, but can you think of a more expressive one?

The Twin Coach removes the last alibi a street car man has for letting somebody else sell over his counters—the streets of his district. Here is the capacity and the answer to the automobile.

This new tool can be put into regular peak hour service, or with the addition of de luxe interior equipment it makes the roomiest and most extraordinary parlor car job on the road.

At the Cleveland AERA convention—space 468-472. The factory is only 25 miles south of the convention hall. Come over! If you are not going to the convention possibly a demonstration is scheduled for your district. Write us about this today.



Twin Coaches-vs-Your Present Jobs

Using Your Present Equipment

1. A peak load condition necessitating a..... 5 minute headway
2. Of coaches with a seating capacity of..... 29 passengers
3. On a round trip with a running time of..... 60 minutes
4. For a distance of..... 12 miles
5. Requires per hour..... 12 coaches
6. With a total seating capacity per hour of..... 348 passengers
7. Or total capacity with 60% standees of..... 556 passengers
8. Requires..... 12 drivers
9. And per hour..... 144 miles
10. And per hour..... 12 pay hours

Using Twin Coaches—Street Car Type

1. 6 minute headway
2. 40 passengers
3. 60 minutes
4. 12 miles
5. 10 coaches
6. 400 passengers
7. (Proven capacity for over 100% standees) 850 passengers
8. 10 drivers
9. 120 miles
10. 10 pay hours

Economy of Operation For 4 Rush Hours Per Day

1. 1 minute difference
5. 8 less coaches
6. 208 more seats
- (with Twins) 7. 1176 more capacity
8. 2 less drivers
9. 96 less miles
10. 8 less pay hours

Due to the smaller per cent increase in equipment required for rush hours over base operation there is opportunity to prepare better schedules for drivers and less liability of having to pay minimum wage guarantee.

How much added investment would you require to furnish Twin Coach capacity with 29 seat coaches?

Do You Remember These?



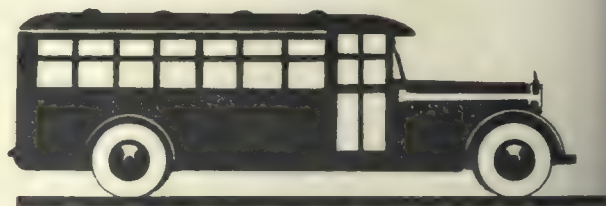
7 PASSENGERS

1916 to 1922



20 PASSENGERS

1922 to 1927



29 PASSENGERS—18 STANDEES

1927 to ?



40 PASSENGERS 45 STANDEES

Street Railway Managers:—If you are faced with problems of heavy track repair or replacement, you owe it to your property to obtain our latest data covering the substitution of Twin Coaches in such instances. *Write us today.*

TWIN COACH CORPORATION, KENT, OHIO

Another Tribute We Are Glad To Acknowledge



FRANK R. FAGEOL is recognized as one of the foremost designers and builders of motor coaches in the United States. On his latest, and most advanced creation, the new Twin Coach, Leece-Neville Patented Voltage Regulation is standard equipment.

This is another tribute to the dependability, economy and efficiency of Leece-Neville equipment that we are glad to acknowledge.

Leece-Neville Patented Voltage Regulators keep batteries charged at the correct rate for all conditions. There's always a "kick" to start the motor. Lights burn brightly and steadily at all times—no flickering.

Be sure that specifications for your motor coaches include Leece-Neville Patented Voltage Regulation. You'll be surprised at the long life of your batteries and the unusually low cost for maintenance.

The Leece-Neville Co.

5353 Hamilton Ave.
CLEVELAND, OHIO





Winners



As the Twin Coach meets every demand for roominess, safety, durability and beauty ... so does the Arcozon pyroxylin lacquer system meet the most exacting demands for a bus finish that will endure in spite of rigorous extremes of varying weather.

Twin Coach ... like many others ... after experimenting with various lacquers, finally selected Arcozon as their permanent finish. The reason is

obvious ... Arcozon does a more thorough and lasting job from the metal up.

The same co-operation and experience in solving bus finishing problems utilized by Twin Coach is available to you.

May we send a man from our technical department to give you complete information? Any time convenient for you will be convenient for us.

THE ARCO COMPANY / CLEVELAND, OHIO
PAINTS / VARNISHES / ENAMELS / LACQUERS (112)



F. R. Fageol achieved light weight in the Twin Coach by adopting **HASKELITE** *and* **PLYMETL**



40 to 50% more passengers
40 to 45% less weight

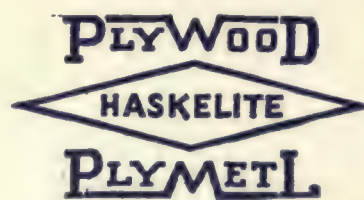


Abstracts from specifications:

Body completely paneled with PLYMETL
Floor $\frac{3}{4}$ in. HASKELITE.

Roof—center section 42 in. x 21 ft., $\frac{1}{4}$ in.
PLYMETL.

Windows—PLYMETL rear corners optional.
Interior Finish—PLYMETL lining below
windows.



Haskelite Manufacturing Corporation
133 West Washington Street, Chicago, Ill.

Railway Representatives:

Economy Electric Devices Co.,
37 W. Van Buren St., Chicago

Grayson Bros.,
600 LaSalle Bldg., St. Louis, Mo.

Railway & Power Engineering Corp.,
Toronto, Ont., Canada ERJ9-17Gray



It is our privilege to supply more than 60 individual malleable parts for every Twin Coach. These parts range from Seat Irons, Door Controls, Hinges and Locks to large and small body castings of many types.

With nearly a half century of experience in the design and production of malleable parts for almost every type of vehicle—Eberhard Irons meet every demand of the Body Builder for Utility, Appearance and Passenger Comfort.

Made in a modern plant of more than 13 acres of floor space with complete facilities for plain, completely machined, japanned or plated castings.

Eberhard Malleables shown at Booth No. 440 A.E.R.A. Convention

The Eberhard Manufacturing Company
Cleveland, Ohio

48 YEARS OF QUALITY AND SERVICE

EBERHARD
MALLEABLES

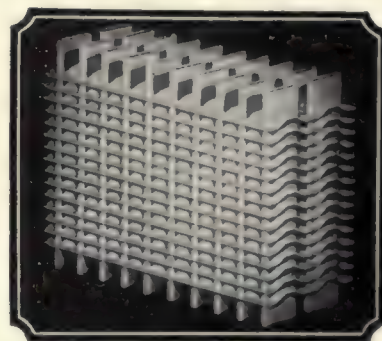
THE TWIN COACH IS TURBOTUBE EQUIPPED



Outline shows location of radiator

TURBOTUBE
Radiator Core

Realizing that the success of his new Twin Coach depended upon the quality of every single part, Frank R. Fageol took no chances—he chose a **Turbotube** Radiator!



Serving the public is an exacting business. Minute schedules must be maintained, capacity loads carried, operation continuous. No matter how extreme weather conditions might be, service must be uninterrupted. No breakdowns, no delays—dependability paramount.

To cope with those conditions Frank R. Fageol knew that his Twin Coach must have a radiator that:

- (1) Has high cooling capacity.
- (2) Possesses great strength.

- (3) Provides unrestricted water circulation.
- (4) Is guaranteed unlimitedly against damage by freezing.

Turbotube has all these features and, what is more, is economical in cost.

It is a worthy tribute to the Modine Manufacturing Company of Racine, Wisconsin, that Frank R. Fageol after a most thorough investigation chose **Turbotube** as standard equipment on the Twin Coach.

*Our Engineering Dept. will gladly show you why **Turbotube** was chosen for the Twin Coach Bus*

MODINE RADIATORS

DOWN THRU

THE

YEARS



WHEN Frank R. Fageol brought out his first bus in California he came to Art-Rattan for seats—for as he lead the bus field then—so were we the pioneer in building comfortable, “ride-inviting” seats. Thus the “rider-appeal” was started. Since that time many changes have been made in bus seat construction—with always one aim in view—“rider-appeal.”

We take particular pride in having been associated with Frank R. Fageol from the first inception of his revolutionary buses. It has been our privilege to have contributed to the success of the entire bus field; for comfortable seats, more than anything else, have made the bus industry what it is today.

THE ART-RATTAN WORKS, Inc.

1715 Leonard Ave., Cleveland, Ohio

and

Oakland, California

The Charm of Leather



AS BUSES are improved mechanically, as they approach private automobiles in comfort and luxury of appointment, it is well to note that only the finest leather is being used to upholster the seats.

Just as a platinum setting calls for a perfect stone, so do the newer buses call for perfect seats. "Rider Appeal" is assured by a smooth, comfortable, smartly tailored leather seat.

The charm of Frank R. Fageol's new Twin Coach is made all the more irresistible by the use of full grain leather upholstered seats. The leather, of course, is supplied by us.

ALFATAN

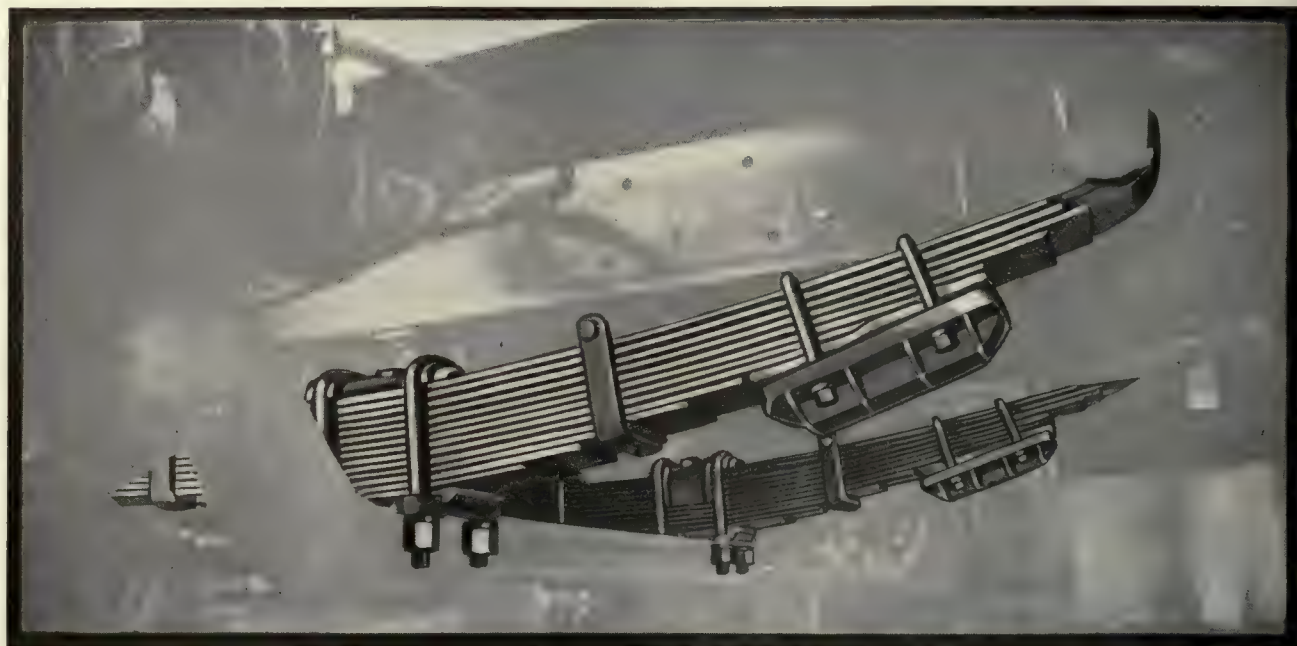
a new Luxury leather, is aniline dyed for penetration of color, and coated with only a thin pigment to level the dyed color. It is being used more and more where the highest quality is desired. Also Hyaline, Chroline Cletan grains and others, a complete line of leather for every upholstering requirement.

THE CLEVELAND TANNING COMPANY

Dennison Avenue at Jennings Road
CLEVELAND, OHIO

NOTHING TAKES THE PLACE OF LEATHER

COMFORT'S UNSEEN PARTNERS



THOSE who know, have long since eliminated the "trial and error" method of spring selection. Frank R. Fageol, famous for Fageol Busses, knew that creation of profits depends largely on springs being properly designed and constructed.

Mather designed the springs for the new Twin Coach—and we're proud of the job. The original design and construction of Twin Coach Springs has never been changed.

Riding a Twin Coach is one long sensation of cushioned resiliency. The product of years of experience manufacturing scientifically designed springs.



THE MATHER SPRING CO., TOLEDO, OHIO

*Makers of scientifically heat treated springs
for TWIN COACH*



***Twin Coach* uses DAYTONS**

In keeping with his watchword, "Rider Comfort and Profitable Performance," Frank R. Fageol has equipped his latest and greatest achievement, the Twin Coach, with Dayton Steel Wheels.

This Dayton Model was especially designed for the Twin Coach. It is a light weight, super-strong steel wheel, always maintaining perfect alignment, secure mounting and proper ventilation of brake drums. Tires run cool and never over-heat.

These outstanding characteristics of Dayton Steel Wheels—

Strength, Light Weight, Durability, Tire Economy, Accessibility and Appearance—help the Twin Coach render consistently profitable performance.

45 Patents Owned By Dayton

Every major improvement has come first in Dayton Steel Wheels. Not less than 45 patents are owned by the Dayton Steel Foundry Company, covering both designs and methods of making steel wheels.

Our New Catalog Will Be Sent On Request

THE DAYTON STEEL FOUNDRY COMPANY
DAYTON, OHIO

Dayton

The Mark of a Good Wheel

STRENGTH—LIGHT WEIGHT—TIRE ECONOMY—DURABILITY — ACCESSIBILITY—APPEARANCE



—not forgetting travel comfort!

In a recent description of the Twin Coach appeared the expression "not forgetting travel comfort." A short expression with a world of meaning—for it's "travel comfort" that sells the service to the public.

That Hale & Kilburn Seats were selected for the first Twin Coaches speaks volumes for their comfort and attractiveness.

For full particulars of the various types of H & K Seats and Chairs, send for our latest catalog

HALE & KILBURN COMPANY

General Offices and Works: 1800 Lehigh Avenue, Philadelphia

SALES OFFICES:

Hale & Kilburn Co., 30 Church St., New York
Hale & Kilburn Co., McCormick Bldg., Chicago
E. A. Thornwell, Candler Bldg., Atlanta
Frank F. Bodler, 903 Monadnock Bldg., San Francisco

T. C. Coleman & Son, Starks Bldg., Louisville
W. L. Jefferies, Jr., Mutual Bldg., Richmond
W. D. Jenkins, Praetorian Bldg., Dallas, Texas
H. M. Euler, 46 Front St., Portland, Oregon

Hale and Kilburn SEATS

TEN WORDS—\$50.00

*T*O the employee of any street railway, steam railroad or motor coach operating organization sending us the best 15 word (or less) slogan epitomizing the capacity, or the buoyant riding qualities and rider appeal of the new Twin Coach by Frank R. Fageol, we will pay \$50.00 in gold.

After your own name and address and place of employment, write the address of the General Manager of the property upon which you are employed. Send all suggestions to—Twin Coach Corporation, Dept. E, Kent, Ohio, U. S. A.

*Entries close November 1, 1927
Winner will be announced in this Magazine
Should two or more persons submit the slogan
considered best, each will receive the prize tied for.*

Note:

Twin Coaches ride over four specially adapted and interchangeable Mather Springs.

Twin Coach is LONG *Equipped*



LONG PRODUCTS
Automotive Clutches
and Radiators

Long radiators have been selected as standard equipment for the Twin Coach, new product of Frank R. Fageol.

Twenty-four years experience in the manufacture of automotive radiators has resulted in a product which merits the approval and confidence of manufacturer and user.

LONG MANUFACTURING CO.
DETROIT, MICHIGAN

LONG



ANNOUNCING BUS BODIES by MURRAY

*An Announcement to Chassis-Builders
and all Operators of Bus Transportation*

» » »



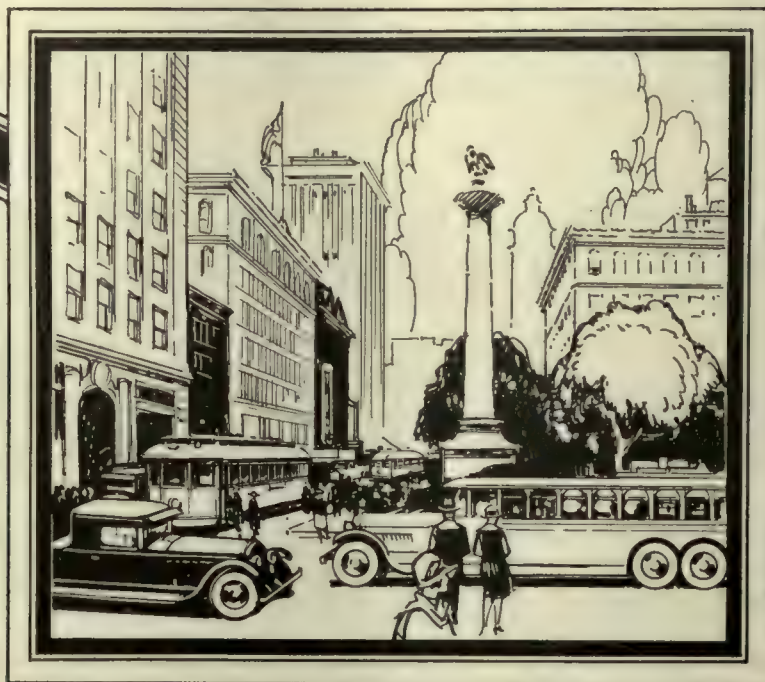
The Murray Corporation of America, creators of automobile coachwork on a large scale, announce production of de luxe Bus Bodies—new and revolutionary in design.

Advanced engineering, based on the actual experience of bus operators for hundreds of thousands of miles, has evolved these bodies of light-weight duralumin. 36% less weight. Increased safety. Greater comfort. Easier riding. Low maintenance. Wear proof. Fire proof. Strong as steel—light as aluminum.



See the Murray Exhibit at the A. E. R. A. Convention, Cleveland. Learn how science has revolutionized motor coach design and manufacture.

Coach Work by Murray



There is *now* a Westinghouse *Automotive* Brake
.....for *every* class of service.

Through the past half century, the Westinghouse Air Brake Company has been indelibly identified with transportation, studying and surmounting its obstacles from the angle of proper control.

Efficient retardation, always a factor in the success or failure of vehicles of transportation, has been given to the automotive industry in the form of two distinct types of brakes, each of which is the ultimate in its respective field and each developed and constructed according to the rigid standard that has ever marked Westinghouse products.

The Air Brake is for heavy duty coaches, trucks and trailers—the new vacuum type for lighter weight commercial vehicles and personal cars. With these two systems of retardation, the Westinghouse Air Brake Company has dominantly filled the braking need in modern highway transportation for a modern brake by bridging the gap between ordinary precation and modern safety and efficiency.

Both types of Westinghouse Automotive Brakes will be on exhibit at the convention in spaces 112-114.

OVER A HALF CENTURY OF BRAKING EXPERIENCE

Speed.... coupled with modern traffic conditions demands a power brake
"Westinghouse brakes are no longer an *accessory* but a *necessity*."

Speed... power... ability... to carry cumbersome and heavy loads—once a problem in the automotive industry, has been mastered by modern engineering skill and combined in the present day highway vehicle.

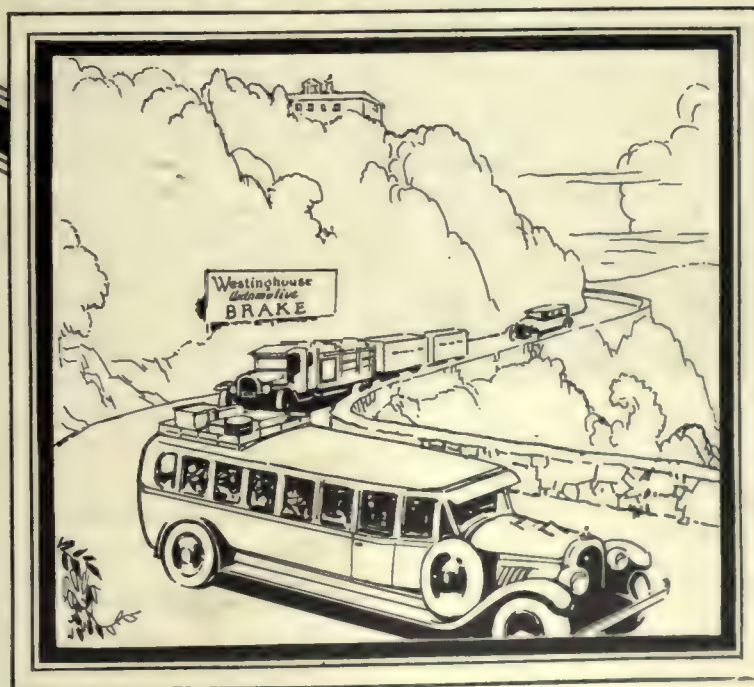
With coaches capable of carrying upward of fifty passengers, maintaining railroad speeds over public highways in inter-city service—large capacity vehicles, single and double decked, bucking the maze of city traffic in feeder service to traction lines—powerful highway express units of rail car proportions hauling trailing loads in addition to their own lading—the need for a modern brake is obvious.

It is to this field of transportation that Westinghouse has been privileged to lend the result of years of research—the *Automotive Brake*.

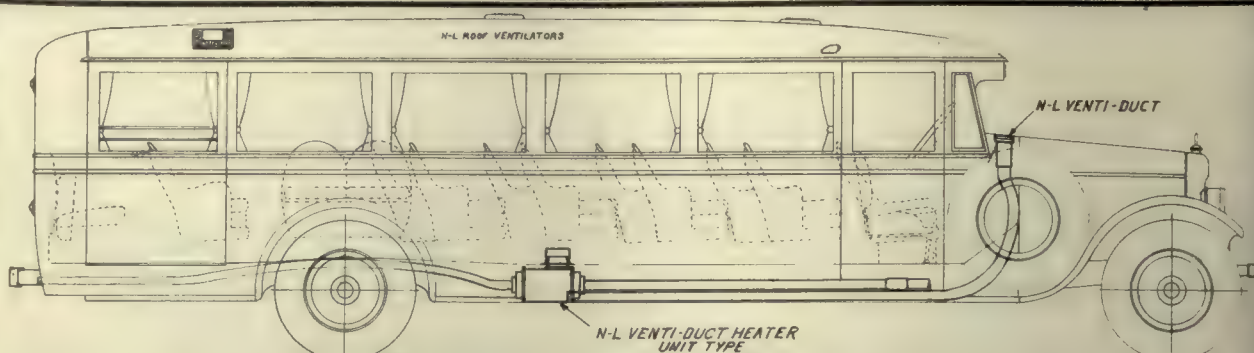
Westinghouse representatives conveniently located in representative cities, welcome inquiry relative to the economic advantages of the modern *Automotive Brake*.

WESTINGHOUSE TRACTION BRAKE COMPANY

Automotive Division... WILMERDING, PENNA.



IS BEHIND THE NAME WESTINGHOUSE



The Venti-Duct Heater

(Unit Type)

The Unit Type, used in conjunction with the Venti-Duct, the all-weather cowl ventilator, and N-L Aerating and Dual Roof Ventilators, delivers large quantities of fresh, hot air into the coach, thoroughly heating and ventilating in the coldest weather.

Obtaining a large heating surface with a greatly reduced length, the Unit Type performance equals the larger type of Venti-Duct

Heater and retains all its advantages. Fire hazard and leaking gas positively eliminated. An even temperature is maintained throughout the coach, there being no hot spots and cool areas. The N-L Heater serves as a muffler, the exhaust heater valve is eliminated. The exhaust passes straight through, minimizing carbon deposit.

Write for details, and see the Venti-Duct Heater at Booth 677, A.E.R.A. Show.

The Nichols-Lintern Co.

7960 Lorain Ave., Cleveland, Ohio



Correct Lighting Low Maintenance Cost

A "Street Car" type
of bus
fitted with
ADLAKE BUS
Lighting Fixtures

Assures to its owners a cheerful and well lighted interior.

Attract passengers to your bus by making the interior bright and inviting by using ADLAKE fixtures.

Space 407 (West Wing)—Cleveland—Oct. 3-7.

Write for Catalogue M-51.

THE ADAMS & WESTLAKE COMPANY
CHICAGO NEW YORK



INTERNATIONAL HARVESTER

Six-Cylinder COACHES

FOR dependable service and low-cost mileage our 6-cylinder Coaches, Model 15, will appeal to any man interested in passenger transportation in any phase. Be sure to see the International Harvester Coaches in the Pay-Enter Street-Car Type, shown above, the Club Coach and the Sedan Coach.

Model 15 is built to carry 15 to 17 passengers—the ideal capacity. Where peak-hour requirements exceed this capacity the use of a second Model 15 will frequently prove highly economical and profitable. Quality conveyances, doubled frequency of service for minimum investment, rigid schedules maintained year in year out—such are the attained objectives in International Harvester design.

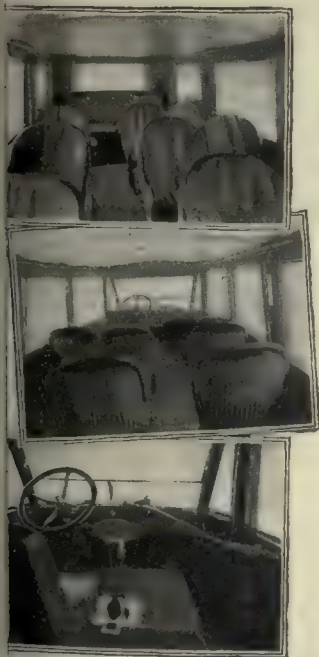
The International Coach, Model 15, has low graceful lines, a superb exterior and a luxurious yet serviceable interior. It has that appeal to passengers that makes them proud to ride and its proved qualities insure profitable patronage.

As for service to attend your coaches, there are 154 Harvester-owned branches all over the United States and Canada. Working on factory standards these branches can service the coaches as well as the factory builds them. Wherever they go International Coaches give good service and get good service as well. *Catalog sent on request.*

INTERNATIONAL HARVESTER COMPANY

606 So. Michigan Ave. OF AMERICA
(Incorporated)

Chicago, Ill.



*Glimpses of the inviting interior
of the 15-passenger
Club Coach*

[[At the A. E. R. A. Convention, Cleveland, Ohio, Oct. 3-7, 1927, International Harvester 6-Cylinder Coaches will be on view. The display includes the Model 15 chassis, the Street-Car Type, and the Club Coach.]]

THE sturdiness and tough resistance to wear that is built into Kelly Bus Balloons gives bus operators an opportunity to add to the riding comfort of their passengers without increasing their operating costs.

KELLY-SPRINGFIELD TIRE CO.
General Motors Bldg. New York, N. Y.



KELLY^{SPRINGFIELD} BUS BALLOONS

**An ENTIRELY NEW
conception of both
Highway and Rail
vehicles . . .**

New

in Design

New

in Construction

New

**in earning power
and distinctively**

New

in appearance

VERSARE

For the first time in TWIN Six-Wheel Rail



The **VERSARE** Six-Wheel Rail Unit

For two years Versare engineers have been working on this design. They were given a free hand. With the results of Versare experience in low-cost popular transportation as a background they strove for perfection in a light, practical, economical and thoroughly modern electric car.

What are the results?

A vehicle that is unique alike in design and performance.

An electric car built entirely of duralumin and light alloy steel,—weighing complete and ready for the rails only 12,500 lbs.

Greater comfort, smoother and more silent operation, than have ever been known in rail vehicles before. Plenty of room for 32 seated and 32 standing passengers.

Automotive type axles and drive, with their attendant simplified maintenance and easy accessibility.

A drive truck unit that can be removed entirely in half an hour. Standard Westinghouse motors and control.

Furthermore the Versare Six-Wheel Rail Unit will be sold complete at an established price, in the same way as automotive vehicles. It offers without doubt the simplest and most satisfactory solution to modernization problems in the great majority of American cities today.

Be sure to see the completed sample car which will be exhibited at the Convention on Track E.

VERSARE CORPORATION
Albany, N. Y.

transportation history and Highway Units



The **VERSARE** **Six-Wheel Highway Unit**

Versare Corporation, the pioneer manufacturer of large capacity, single-deck highway units, announces this new six-wheel unit as a distinct advance.

With a capacity of 35 seated and 35 standing passengers, it is the lightest weight gas-electric coach of this size that has ever been built, weighing complete only 13,500 lbs.

It embodies identically the same structural units and truck design which have proved their efficiency, economy and low depreciation through hundreds of thousands of miles of service on our eight-wheel vehicles.

Note particularly that the power plant is mounted at the extreme rear end of the body. It can be quickly removed and replaced without disturbing the radiators or fan units, and without the use of an overhead crane.

No oil or gas fumes can seep into the coach interior because all seams in the engine housing are sealed with asbestos or rubber.

Gas-electric drive is through two standard Westinghouse traction type 33 hp. motors mounted on the rear four-wheel trucks,—generous power for a vehicle of this size, resulting in the speed and pick-up for which Versare Highway Units have become famous.

Study the more detailed specifications given overleaf. Note the radical difference between ordinary coaches and this highway unit built specifically to meet electric railway operators' needs.

Then be sure to see the complete sample unit on exhibition at the AERA Convention in Cleveland—Space 476.

VERSARE CORPORATION
Albany, N. Y.

Weigh carefully these specific advantages and innovations

The VERSARE Six-Wheel Highway Unit

1. No chassis. Duralumin truss construction in accordance with railroad practice.
2. Body maintenance practically eliminated.
3. Unit power plant mounted at rear. Quickly removable without crane.
4. Radiator and fan units separate from power plant. Easily removed from side of body.
5. No engine heat, oil or gas fumes can enter body.
6. Body built of interchangeable units identical with those of the eight-wheel vehicle.
7. Versare Hercules-Westinghouse gas electric drive. Two 33 hp. standard traction type motors.
8. Turning radius of 56 feet.
9. Electric brake. Westinghouse air service brakes and mechanical emergency brake.
10. Versare Patented Equalizer at rear drive axles,—floating ease in riding.

The VERSARE Six-Wheel Rail Unit

1. Built entirely of Duralumin and light alloy steels.
2. Four wheel, single motor automotive type drive bogey in rear. Two wheel automotive type single motor drive axle in front.
3. Patented Versare Equalizer,—floating ease in riding.
4. All body sections interchangeable with standard replacement units.
5. Drive truck and motors removable complete in half an hour.
6. High speed with safety.
7. Maximum passenger capacity with exceptional comfort. 32 seated, 32 standing.
8. Silent operation.
9. Standard Motors, control and safety air brake equipment. Internal band brakes.
10. Highest quality standard equipment throughout.

VERSARE



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Stackpole Carbon Co.

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Texas Oil Co.

Universal Lubricating Co.

Young Bros. Co.



Milled to an average variation in thickness of less than $\frac{1}{1000}$ th of an inch!

The man above is milling Micanite Plate for Commutator Segment Insulation. His job is one of the many jobs that insures the high quality and unvarying dependability of Micanite.

Micanite Plate for Commutator Segment Insulation is closely milled. Its average thickness will not vary more than .0005 in. from

the specified thickness. Individual plates will not vary in isolated spots more than .001 in. above or .0015 in. below the thickness specified.

This is an example of the thorough, careful manner in which we manufacture both Micanite and Empire Products. For 33 years these insulations have been made to one standard only—the highest.

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MICA INSULATION

OILED CLOTH INSULATION

TRIBLOC CHAIN HOIST

—for “better transportation” in the shop

There are two kinds of “better transportation.”

One supplies the theme for the AERA Convention soon to be held. The other includes handling of loads *in the shop*, and as such will undoubtedly be considered as an individual railway shop problem.

Because Ford Tribloc Chain Hoists provide an economical way of solving this load handling problem, their installation arms your men with an effective weapon for cutting costs. The advantages assured by their MALLEABLE IRON and FORGED STEEL construction together with the Special Analysis High Carbon Heat Treated Load Chain, have been proved in some of the largest shops in the world.

Triblocs are safe, cost very little to maintain, and their first cost is low enough to be profitably included in the limited budgets of small roads as well as large.

Let us send you Catalog 7-B.

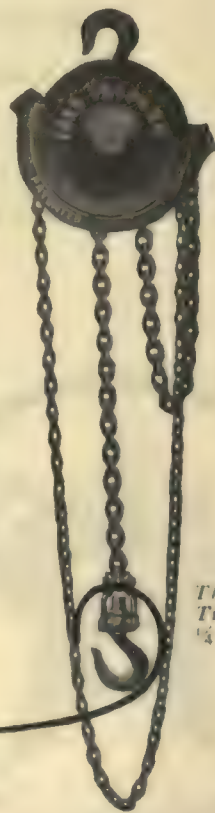
An improvement that makes a Tribloc easier to use

In the manufacture of Ford Triblocs, it is an established policy to adopt only those ideas which actual use and engineering tests have demonstrated will make Triblocs more effective in the hands of users.

The new Ball Bearing Load Hook therefore becomes a part of Tribloc Chain Hoists with the assurance that it has proved its value.

Let us show you this improved Load Hook. Let us tell you why the MALLEABLE IRON and FORGED STEEL construction of Ford Triblocs means better, longer-lived hoists.

This new Load Hook rotates on Ball Bearings, making the hoist easier to use.



This shows the Tribloc in the 1/4 to 2-ton size.

FORD CHAIN BLOCK COMPANY

2nd and Diamond Sts., Philadelphia, Pa.

Inseparably Linked

{ Better Transportation { Better Lubrication

SAYS the Public: "Give us better service."

Says the operator: "How can I so reduce operating costs per car mile that more money can be made to put into good service?"

So, in his search for economies here and there he has lighted on lubrication. And in only too many cases he has cut his lubrication costs only to add the differences plus interest to maintenance repairs and depreciation.

Lubrication, after all, is a very exact science these days. It has taken TEXACO a good many years to get down to workable formulas for efficient electric railway lubrication. There's a tremendous aggregate of hard earned experience behind the TEXACO Lubrication Engineer's recommendation when he places it on your desk.



TEX

THE TEXAS COMPANY

Dept. E92. 17 Battery Pl.

Off.

WITH all frankness, no electric railway executive should be expected to add this to his burden of responsibilities; and that is why many thousands of miles of leading electric railway properties throughout the country are now lubricated by TEXACO down to the last switch.

The TEXACO Engineer recommends the oil or grease, and the quantity to be used, for each individual unit. Satisfaction is guaranteed by an organization of unquestioned standing. And lubrication worries are no longer a part of the picture.

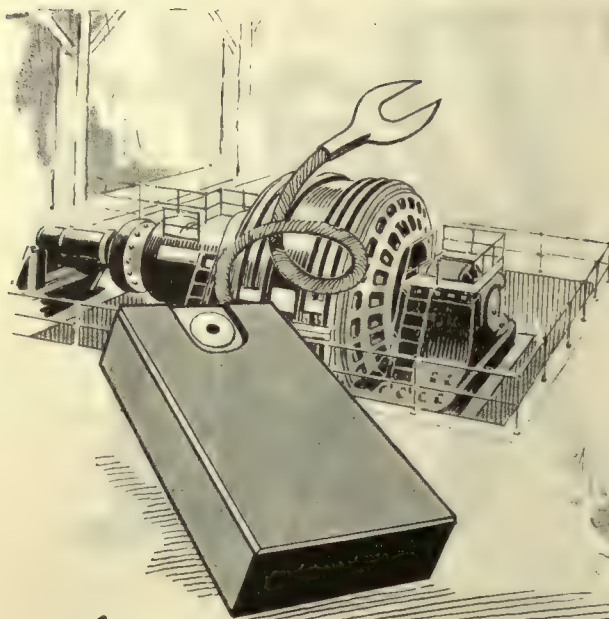
Call on us at any time to survey your property without obligation but with an assurance of intelligent cooperation.

THE Texaco Booth No. 129-130 in Cleveland will be a comfortable place to discuss preliminaries or to renew old acquaintances. Be sure to stop in!

TEXACO

Texaco Petroleum Products
NEW YORK CITY
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Why "Le Carbone"? Carbon Brushes!

You will find the answer at
BOOTH 225
A. E. R. A. Convention
CLEVELAND



WHETHER to reduce your brush costs, to increase commutating efficiency, to protect your commutators or to prevent flash-overs on cars and in the power house, there are many reasons why it pays to standardize upon "Le Carbone" Carbon Brushes. We will be glad to discuss these reasons when you visit our exhibit in Cleveland. Or send for sample brushes that are suited to your needs.

They talk for themselves

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Pittsburgh Office: 634 Wabash Bldg.
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DeVilbiss

at the

Cleveland Convention

A. E. R. A.

DeVilbiss spray-finishing equipment, for applying better finishes on electric railway and bus equipment at a fraction of former maintenance costs, will be on display in

Space 460

Section C, West Wing Auditorium

during the entire meeting of the A. E. R. A. at Cleveland, October 1st to 7th You are cordially invited to visit this exhibit where complete information will be available as to the advantages of this improved way of painting and as to the equipment best adapted to your individual requirements.

THE DEVILBISS CO., TOLEDO, OHIO

DeVilbiss
Spray-finishing System



Non - Stop

The epochal non-stop flights of Lindbergh and Chamberlin were extraordinary feats of courage on the part of the men and an extraordinary evidence of mechanical endurance on the part of the plane motors. With Stackpole Brushes however non-stop performance is a matter of every day accomplishment throughout industry.

Stackpole equipped street car motors run with the certainty and surety that only a brush *built for the purpose* can give.

Built for the purpose is a mighty important thing in carbon brushes for electric railway motors and thats exactly what you get with Stackpole L-30, A-20 or M-11. Specify them in your next order.

STACKPOLE CARBON COMPANY
St. Marys **Penna.**

Stackpole

carbon brushes



To Aid you



IN ALMOST every plant may be found a unit or a group of machines that constitutes a lubricating problem. You may have such a problem. It may be in the power plant, in the shafts and drives by which power is transmitted, or elsewhere. The operator in charge may be an expert in his line, yet he can hardly be expected to have the necessary time to solve difficult lubricating problems.

To assist you in such problems, the Standard Oil Company (Indiana) maintains a staff of lubricating engineers, who are being called more and more to consult with progressive concerns.

These men are competent and willing to make a survey of your plant, as they are doing in hundreds of others, and submit a report with recommendations for securing lower operating costs through correct lubrication.

A phone call or letter directed to our nearest branch will bring you one of these lubrication engineers.

With Standard Oils and Greases Goes Standard Oil Service

The Standard Oil Company (Indiana) has branch offices and warehouses in practically every town in the ten midwestern states which comprise its territory. These warehouses serve as distributing points for you and carry your supplies of oil and grease in stock. Our trucks deliver the lubricants in iron barrels to your shops as they are needed, and pick up the empties without extra charge. As there is a Standard Oil warehouse in your town or near enough to it to give you delivery service, it is necessary for you to have on hand only enough lubricants to keep you going from week to week, thus effecting for you many important economies in handling, storage space and insurance.

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No Excessive Hammering on These Coils

It isn't necessary. They slip into slots without it. They're built to fit.

Save time and labor. Prolong coil life by eliminating coil abuse.

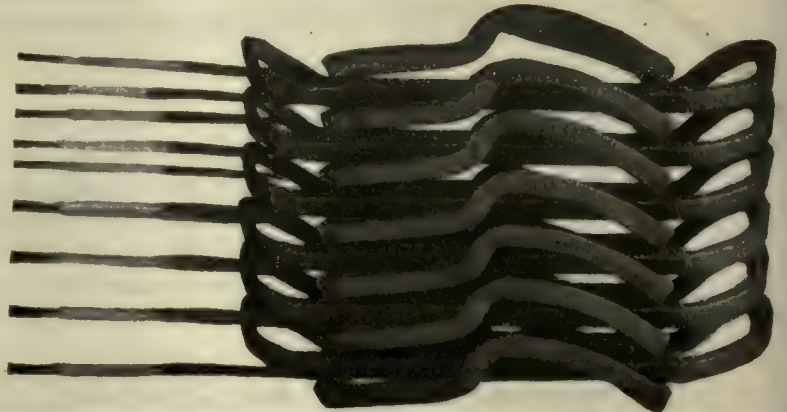
Thirty-seven years have taught us how to meet your individual needs.

Send for particulars and prices.

Address—

**The Elliott-Thompson
Electric Co.**

Ajax Building, Cleveland, Ohio



We make a specialty of
**ELECTRIC RAILWAY
LUBRICATION**

We solicit a test of TULC
on your equipment

The Universal Lubricating Co.

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*Manufacturers of Steel Structures of all classes
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the equipment or machinery that you are not using. This may be occupying valuable space, collecting dust, rust and hard knocks in your shops and yards.

Sell it

before depreciation
scraps it.

*The Searchlight Section is
helping others—
Let it help you also*

0067



Robbing Peter!

Winding anything but the best tape into a repair job is simply "robbing Peter to pay Paul" . . . and Paul's price is always high.

To be profitable, a repair should always equal, if not surpass, the original. Thoroughness in the beginning pays in the long run.

For Safety Use Acme Varnished Cambric Tapes

Electrically and Physically Tested for

DIELECTRIC STRENGTH
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TENSILE STRENGTH
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COMPOUNDS

Acme Varnished Tapes are furnished in widths of $\frac{1}{4}$ inch and wider, and in rolls of continuous length without splices. Special widths and finishes supplied on order. Write for catalog 3-J for your files.

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Main Office and Plant, New Haven, Conn.

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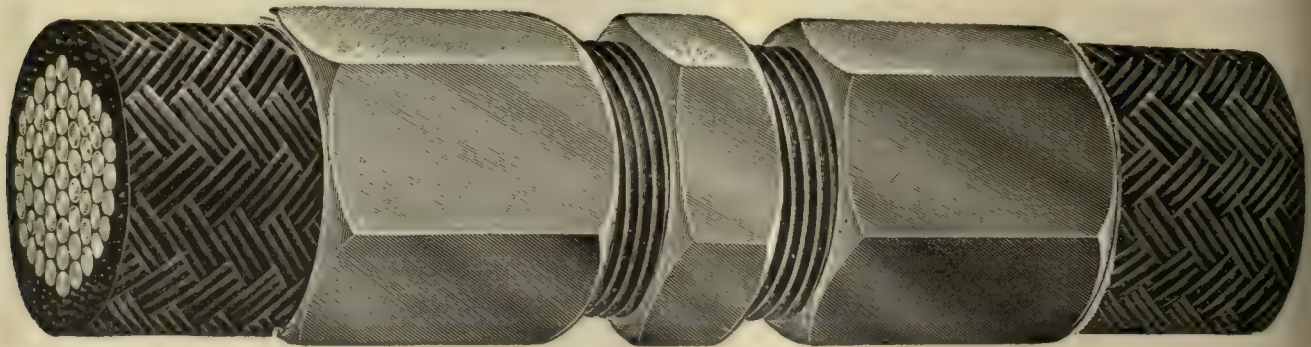


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P.T.L. Inspection Service is available in all the large production centers throughout the country. These men are thoroughly experienced in every technical phase of railway equipment construction and can therefore render complete progressive inspection of all materials you purchase. Your interests and responsibilities are always perfectly protected with a P.T.L. man on the job.

Send for Bulletin 28 containing a full explanation of P.T.L. service.

PITTSBURGH TESTING LABORATORY
Pittsburgh **Penna.**
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DOSSERT Solderless Connectors

are furnished in every required size and type for conductors from No. 14 B & S gauge, to large cables of 3,000,000 cir. mils.

DOSSERT Solderless Connectors

Tests which have been made from time to time by users of Dossert connectors show that the connectors run at as low temperature as enabled by the wires connected to them.

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DOSSERT & COMPANY, 242 West 41st Street, New York
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**Includes Searchlight Section
What and Where to Buy Section
Alphabetical Index*



Designed for Severe, High-Speed Service

Ploughing its course at flying speed through the open stretches of the country, or nosing its way cautiously through the congested sections of the city, the interurban car demands the best there is in equipment,

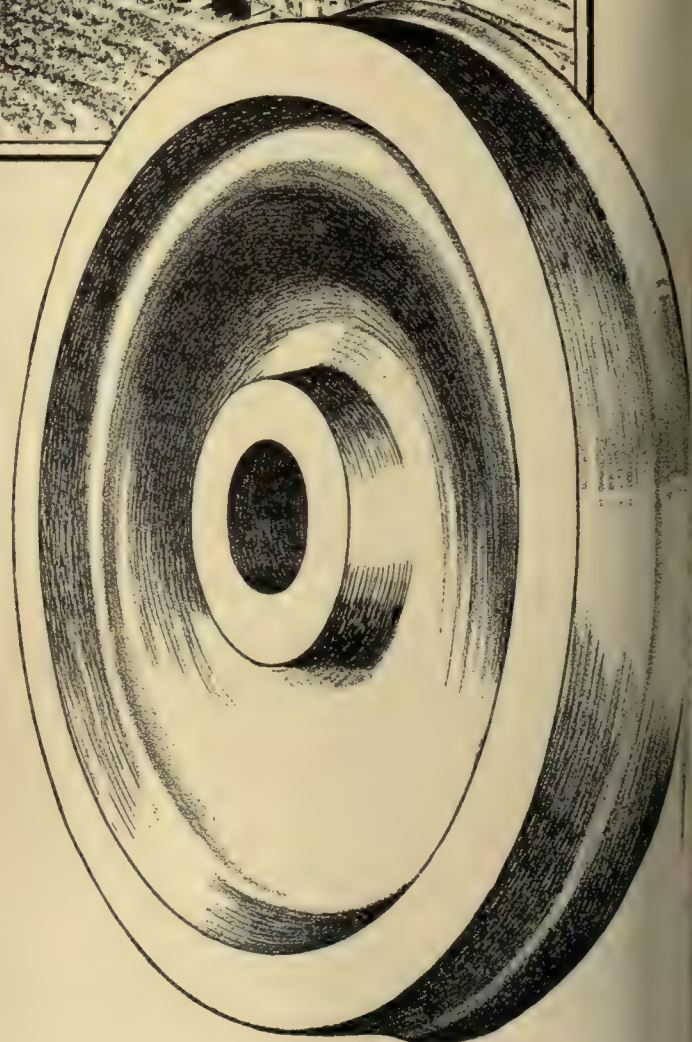
The wrought steel structure of Gary Wheels offers freedom from fractured flanges, cracked plates and chipped rims; rolled steel against rolled steel offers superior braking contact, especially appreciated in emergencies; and the principle of multiplied mileage offers an exceptionally low cost per mile of service.

*Our wheel engineers will be glad
to explain further.*

Illinois Steel Company

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208 South La Salle Street
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101 YEARS OF MANUFACTURING EXPERIENCE

Cane Webbing may be
ordered through any
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No. 327-M

SEE THIS NEW SEAT AT THE A. E. R. A. CONVENTION!

WHILE attending the A. E. R. A. Convention in Cleveland, it will be well worth your while to see this Heywood-Wakefield design.

The 327-M is one of the newest electric railway seats in our line. It has deep, double spring cushions shaped to allow more leg freedom. Mechanism rails are set in. The individual backs are properly pitched for comfort.

Many railways have already adopted and installed this new pattern, about which we will be glad to give you complete information. The Heywood-Wakefield exhibit will be in spaces 263, 264, and 265.

Heywood-Wakefield
REG. U.S. PAT. OFF.

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The JOHNSON Automatic Electric gives Instantaneous Record of Every Fare—As

And

The coin does

Safeguards Revenue

The instantaneous, automatic registration of every fare, with the audible bell signal on the overhead register eliminates all chance of error and insures full collections.

Speeds Traffic

The platform work is lighter, the movement quicker and stops are thereby shorter.

Prevents Accidents

Platform men can give more attention to loading and unloading and passenger movements are quicker and safer.

Increases Collections

Inspection and check of collections is made simple and quick by the combination of audible and visible registration, and collections increase as much as 5% when the Johnson System is used.

Facilitates One Man Operation

Several properties have found that the Johnson Automatic Electric Fare Box simplifies the platform work so that one man operation is made practicable where otherwise it could not be done.



(Over 50,000 Type D Boxes have
been placed in service during the
last 15 years.)



JOHNSON FARE BOX

4619 Ravenswood Ave., CHICAGO

Electric Fare Box Registration

**Paid
all the
Work!**



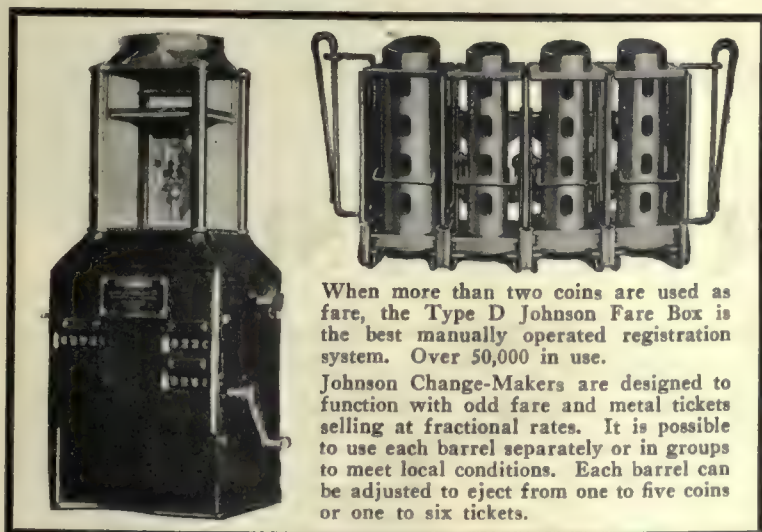
with

Audible and Visible Check

The Johnson Registering Fare Box System provides that every fare, at the instant it is collected, is immediately registered and counted, so that the companies interests and income is safeguarded at the source. The overhead register is energized only when the coin closes a circuit in the fare box, and instantly registers the fare, and gives an audible bell signal. The overhead register is an important part of the Johnson Electric Fare Box System. This method of fare collection appeals to the travelling public as being scientific, progressive, and modern, and hearty cooperation is the result. The honesty of the platform man is clearly established, and he appreciates the assistance he receives from this System. Write for descriptive literature.

OVER 4,000 JOHNSON ELECTRIC FARE BOXES ARE ALREADY IN SUCCESSFUL OPERATION ON OVER 20 OF THE LEADING TRACTION AND BUS COMPANIES INCLUDING SUCH PROPERTIES AS:

Brooklyn City Railway Co.
Public Service of New Jersey
United Traction Co., Albany, N. Y.
Third Avenue Railway Systems,
New York
Consolidated Street Railway Co.,
Worcester, Mass.
Twin City Motor Bus Co.
Georgia Power & Light Co.,
Atlanta, Ga.
Los Angeles Motor Bus Co.
Los Angeles Electric Ry. Co.



When more than two coins are used as fare, the Type D Johnson Fare Box is the best manually operated registration system. Over 50,000 in use. Johnson Change-Makers are designed to function with odd fare and metal tickets selling at fractional rates. It is possible to use each barrel separately or in groups to meet local conditions. Each barrel can be adjusted to eject from one to five coins or one to six tickets.

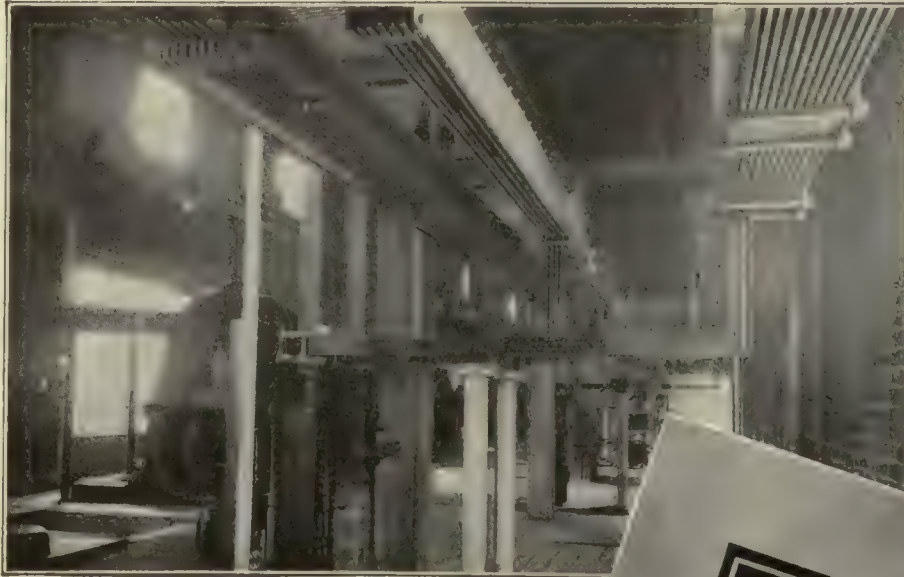
BOX COMPANY

NEW YORK

2 W. 61st Street



Over 4,000 Johnson Automatic Electric Fare Boxes have been placed in service in the last 3 years.



24,000 Ampere Aluminum Bus Line showing connections to circuit breakers.

*An interesting subject
for Electric Railways
and Industrial Stations
using large blocks
of power.*



A new booklet ☞

ALUMINUM BUSBAR

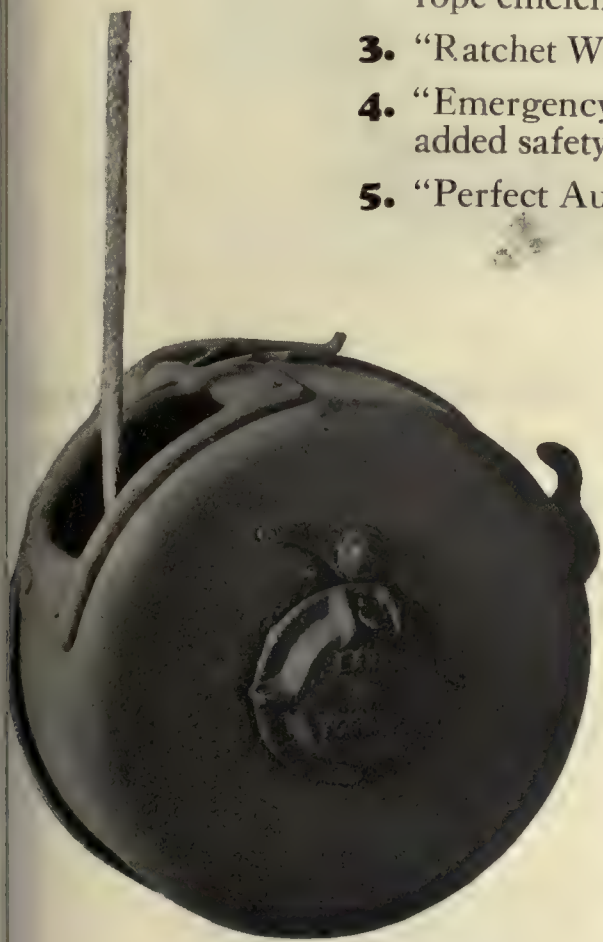
Send for your copy of this booklet which is just off the press. It is a brief text book containing the information required by designing engineers, including: Carrying Capacity, Joints, Deflections and Stresses, Specifications and Tables. Sent post-paid on request, no charge.

ALUMINUM COMPANY of AMERICA
2303 OLIVER BUILDING - - - PITTSBURGH, PA.

There are 5 good reasons

EARLL SUPERIORITY

1. "No Wear Check Pawl" never strikes joint of tooth—always slips into full engagement.
2. "Free Winding Tension Spring" handles wet rope efficiently.
3. "Ratchet Wind" makes retriever operation easy.
4. "Emergency Release" great convenience and added safety.
5. "Perfect Automatic Lubrication of every part."



*see them
demonstrated
at the*
CONVENTION



BOOTH 615

C. I. EARLL, York, Pa.

Canadian Agents:
Railway & Power Engineering Corp., Ltd., Toronto, Ont.
In All Other Foreign Countries:
International General Electric Co., Schenectady, N. Y.

EARLL

CATCHERS & RETRIEVERS

TWO NEW DEVELOPMENTS IN

Gas-Electric Drive Snow Sweeper



ELECTRIC RAILWAYS can use this machine to advantage in removing snow from city lines and the tracks in front of car barns; also clearing bus routes on streets and highways.

Brooms are rotated by an electric motor with chain drive and control similar to standard rail sweeper. Broom speed is entirely independent of vehicle speed.

When operating machine as a sweeper, operator drives from rear cab facing broom, and machine runs with broom foremost.

Chassis is equipped with gas-electric drive giving very flexible speed and broom control.

The machine is readily converted into a utility truck by removing rear cab and broom and substituting in their place any type of body suitable for construction and repair work. Machine is then driven from front cab. The convertibility of this unit makes it serviceable throughout the year.

See This Machine at the Cleveland Convention

Designed and Built by

CUMMINGS CAR AND COACH CO.
CHICAGO

MODERN RAILWAY EQUIPMENT

A Real Light Weight Car



Built for the Chicago and Joliet Electric Railway

THE BODY DESIGN and CONSTRUCTION having many new and novel features will be of special interest to all electric railway operators.

SCALE WEIGHT CAR complete . . 23,722 lbs.

Seating capacity 50—Trucks, Automotive Drive Type

WEIGHT per Seated Passenger 474 lbs.

Length overall 41 ft. Width over posts 8 ft. 6 inches.

All Aluminum Body including underframe.

One man operation with automatic rear exit.

Special Sliding Door Construction with Two Folding Steps. Low Step heights without well or drop platform.

Combined Rheostat and Air Braking.

Accelerating and Braking currents utilized for heating car.

See This Car at the Cleveland Convention

Built and Exhibited by

CUMMINGS CAR AND COACH CO.

CHICAGO

TUCO



FLEXOLITH FLOORING

For the Car de Luxe

Flexolith Flooring in a de Luxe Type car operated by the Public Service Corporation of New Jersey. This photograph clearly shows the manner in which Flexolith may be applied to trap doors.

FLEXOLITH Special H. W. Mixture not only makes a smooth, permanent and fireproof floor for cars and buses but may be laid over a thinner and unfinished floor foundation. It is attrac-

tive, sanitary and durable. In addition its use contributes to the structural strength of the car or bus. We will be glad to mail you details or to furnish you full information at—

Booth 644 A. E. R. A. Convention

TUCO PRODUCTS CORPORATION

Executive Offices, 30 Church Street, NEW YORK

80 E. Jackson Boulevard, CHICAGO, ILL.

915 Olive Street, ST. LOUIS, MO.

MONTREAL, CANADA

ST. PAUL, MINN.

LOUISVILLE, KY.

630 Louisiana Ave., WASHINGTON, D. C.

751 Monadnock Building, SAN FRANCISCO, CAL.

HOUSTON, TEXAS

BOSTON, MASS.

Buffalo's New Transfers



MAIN-8 OUT

SAT-SEP 17:27

001000

NOT GOOD IF DETACHED

Reduced 15%

P.M.
This Coupon denotes that hour punched on body
001000
of transfer is P. M. HOUR
Not good if detached

EMERGENCY
This Special Transfer issued ONLY at time of paying fare and good ONLY via route punched. (SEE BACK)

FOLLOWING DATE
A.M. 3 4 5 6 7 8 9 10 11 12 NOON
P.M. 1 2 3 4 5 6 7 8 9 10 11 12

ISSUE
OFF ROUTE
WILLIAM
UTICA CTWS
SCANDOR
MICHIGAN
SENECA
JEFFERSON
KENMORE
KENTINGTON

REGULAR
BEST
BROADWAY
CLINTON
CONN.
EAST UTICA
ELMWOOD
FILLMORE
GRANT
JEFFERSON
KENMORE
KENTINGTON

INTERNATIONAL RY. CO.
THIS STUB TO BE ACCEPTED AS FARE ON INTERSECTING LINE PUNCHED ON THE BODY OF TRANSFER.

Reverse side indicating transfer limitations

If transfer is not accepted, fare should be paid and the circumstances promptly reported to the General Offices.

INTERNATIONAL RAILWAY CO.
B. J. YUNGBLUTH, President

I-Inbound; O-Outbound

To Route	Dirac	Junctions & Limitations
East	O	Best & Elm
Broadway	O	Wash. & N. Div. or Way.
Clinton	O	N. Division & Elliott
Connecticut	O	Alton & Main
East Utica	O	Utica & Main
Elmwood	O	Senece & Main
Fillmore	O or I	Fillmore & Main
Genesee	O	Kentel & Main
Grant	O	Wash. & N. Div. or Gen.
Jefferson	I	Jefferson & Main
Kenmore	O	Florence & Main
Kentington	O	Ferry & Main
Michigan	O or I	Ferry & Main
Niagara	O	Shelton Square
Senece	O	Senece & Washington
Sycamore	O	Wash. & N. Div. or Huron
Utica Crosswn.	O or I	Utica & Main
William	O	N. Division & Elliott

Form 8-D

A MISDEMEANOR

Attention is called to the Penal Code providing penalty of fine and imprisonment for the misuse of transfers.

OFFICIALS of the International Railway Company designed these transfers to meet the specific conditions in Buffalo, almost 100% one-man cars and universal transfer privileges.

Change-over to the new transfers was made with the full support of the public and practically no misunderstandings by passengers.

Many features of these Buffalo transfers merit close examination.

International Railway executives report the following advantages to date:

Marked relief in traffic congestion during peak hours, due to greater speed in issuing and receiving transfers—

Abuse practically eliminated—
Notable decrease in the number of transfers issued.

THESE ARE THE SURE PATHS TO
INCREASED REVENUE

INTERNATIONAL RY. CO.

NO ADDITIONAL TRANSFERS ISSUED ON THIS TICKET

001000

SAT-SEP 17:27

12 NOON 1 2 3 4 5 6 7 8 9 10 11 12

FOLLOWING DATE
1 2 3
A.M. A.M. A.M.

KENMORE-9 IN

CAR TO CAR

P.M.
This Coupon denotes that hour punched on body
001000
of transfer is P. M. HOUR
Not good if detached

4 NOTCH PERFORATION 27
GLOBE TICKET COMPANY, PHILA., PA.

This REGULAR TRANSFER issued ONLY at time of paying fare, and on Pay as You Leave Cars ONLY at transfer junctions Good for a continuous ride on first car leaving proper transfer junction within time limit punched. NOT TRANSFERABLE. (See Back)

Booths 212 and 213, A. E. R. A. Convention.



Congestion means delay, mistakes, revenue leaks, abuse, unfavorable public opinion, accident claims.

Printed, numbered, abuse-proof ticket forms are the only sure safeguard against fare collection hazards. Simple and economical; once used, forever dead. And serially numbered forms provide unequalled auditing control.

For over fifty years the Globe Ticket Company has been specializing on the reduction of all these hazards by providing ticket and transfer systems for the speedy and accurate handling of crowds under every known type of fare collection.

Globe

TICKET COMPANY

112 North Twelfth Street
PHILADELPHIA

NEW YORK BOSTON BALTIMORE
CLEVELAND LOS ANGELES

PASS BEAR
ON NORFOLK TRANSPORTATION DIVISION
VIRGINIA ELECTRIC AND POWER COMPANY
AUG. 29 to SEPT. 4
Inclusive
WEEKLY PASS

35

GLOBE TICKET COMPANY, PHILADELPHIA

VICE PRESIDENT

NEW OHMER Machines

To be shown for the first time at the
Cleveland A. E. R. A. Convention

THESE machines introduce startling innovations in the science of transportation. What they do is astonishing. Without displacing any other OHMER products, they extend the scope of OHMER service into a wider field of usefulness. You will see *traffic history in the making* when you witness demonstrations of these machines.

We are also showing for the first time a new line of OHMER No. 79 *Ticket Printing Registers* with electric motor drive, printing cash totalizer, visual indication, 2,250 ticket roll capacity and cash drawer.

And our exhibit will also contain working displays of many improved types of OHMER *Fare Registers*, OHMER *Taximeters*, OHMER *Industrial Counters*, and other

OHMER devices for recording time, speed, and mileage for all kinds of cars and vehicles.

The OHMER exhibit will indeed be a fascinating and educational display of the latest in OHMER precision instruments. You are invited to inspect it. Plan to spend enough time in this exhibit to absorb information that will be of incalculable value to you in your line of business.

CLEVELAND—October 1 to 7, 1927

Spaces 227 to 233, Inclusive

Exhibition Hall — Section B — Cleveland Public Auditorium


REG. U. S. PAT. OFF.
Fare Register Company
Dayton, Ohio, U. S. A.

The Spirit of St. Louis



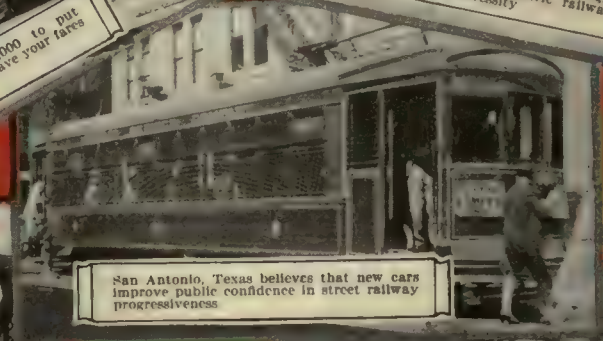
Memphis, Tenn. paid \$475,000 to put courtesy behind the words "have your fares ready, please."



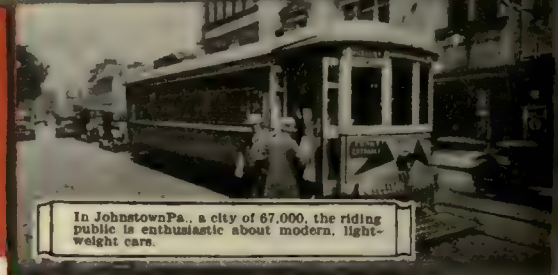
The people of Muskegon, Mich. agreed that with modern cars, electric railway transportation is a necessity.



Chicago met an expiring franchise date with new modern cars.



San Antonio, Texas believes that new cars improve public confidence in street railway progressiveness.



In Johnstown Pa., a city of 67,000, the riding public is enthusiastic about modern, lightweight cars.

These properties caught the spirit of progress

Imbued in the minds of these Electric Railway Operators is the Spirit of Progress—Vision, Courage—that indomitable spirit which "pushes back the borders of the impossible"—that dynamic force behind progress.

By this Spirit, criticism has been turned to commendation, tribulations to tributes, poverty to profits, and investment

to income. Physical and mental hazards have been swept aside by an irresistible ambition to attain an ideal.

And guided by the Spirit of St. Louis Quality Shops, the street car is attaining an even greater scope of utility—is being kept abreast of the times in an endless process of improvement.

St. Louis Car Co.



is the Spirit of Progress



St. Wayne, Indiana handles heavy transportation with one-man cars, substantially 100% St. Louis cars

New cars in Aurora, Illinois cut power costs just about in half

By the use of 27 new light-weight cars, Grand Rapids re-won public favor and cut operating costs

Realizing the need of up-to-date cars to obtain increased patronage, Jamestown, N. Y. spared no expense in putting new deluxe safety cars in city operation

These all-steel, center-entrance, end-exit P A Y E cars of the Pacific Electric Railway, Los Angeles, average 25 m.p.h. Patrons appreciate their comfort at high speeds

and are meeting the demand for better transportation

In nearly every case some obstacle had to be surmounted before progress could be made. From an expiring franchise to an exasperated public, from balance sheets in red to boastful competition—the whole gamut of mental and physical inertia stood in the way of a forward gesture and progressive action.

There lies the significance of the achievements by these roads. Study the design of St. Louis Quality cars—their modern, light-weight fitted-to-the-job, patronage-appealing features. Some of them will be at Cleveland for just this purpose. You'll find that you, too, can put the Spirit of St. Louis to practical, profitable use on your own property.

St. Louis Car Co.



Comfort—the keynot

In every community comfort is a growing factor in selling service to the public. For though good looking exteriors and nicely finished interiors may attract patronage, it's *comfort that sells the rides*—the repeat rides that build up business on a permanent basis.

In order to meet this demand Hale & Kilburn Seats are designed primarily for passenger comfort. But at the same time they are strong, durable and graceful.



H & K No. 900 Double Rotating Chairs in new W. B. & A. articulated cars.



H & K No. 900 Double Rotating Chairs in new C. H. & D. interurban cars.

H & K No. 905 Individual Chairs in Pittsburgh Railways' remodelled experimental car.



Types and styles for every class of service

Be sure to visit us
at the
Cleveland Convention
Booths 204, 205 and 206

Hale and Kilburn SEATS

community service

The specification of H & K Seats by prominent Railway Companies is excellent evidence that they fully meet the exacting requirements of modern city and interurban service.

Whatever your seat problems may be, H & K Seats will provide the answer. One of our representatives will be glad to consult with you at any time.

Get the H & K Catalog
for complete descriptions

Hale & Kilburn Co.

General Offices and Works:

1800 Lehigh Avenue, Philadelphia

Sales Offices

Hale & Kilburn Co., 30 Church St., New York

Hale & Kilburn Co., McCormick Bldg., Chicago

E. A. Thornwell, Candler Bldg., Atlanta

Frank F. Bodler, 903 Monadnock Bldg., San Francisco

T. C. Coleman & Son, Starks Bldg., Louisville

W. L. Jefferies, Jr., Mutual Bldg., Richmond

W. D. Jenkins, Praetorian Bldg., Dallas, Texas

H. M. Euler, 46 Front St., Portland, Oregon



H & K No. 900
Double Rotating
Chairs in C. N. S.
& M. cars.



H & K No. 15 Single
Revolving Chairs and
No. 900 Double Chairs in
special combination car.



H & K No. 900-D Double
Stationary Chairs, with-
out arm rests, in new
C. H. & D. city cars.

Hale and Kilburn SEATS

HASKELITE ROOFS



On the
Grand Rapids Railway Co.
Grand Rapids, Michigan

27 cars built by St. Louis Car Company. PLYMETL side panels. HASKELITE roofs, headlinings and interior finish. This company now rebuilding ten cars using HASKELITE products. Note the letter from Mr. L. J. De Lamar, Vice-President and General Manager.

Ask for detailed blue print booklet
HASKELITE MANUFACTURING CORPORATION
133 West Washington Street
Chicago

Railway Representatives
Chicago Electric, Chicago, Ill.
St. Louis Car Co., St. Louis, Mo.
General Electric, Chicago, Ill.
Barnes & Fox, Chicago, Ill.
Tucker, Chicago, Ill.

March 28th, 1927.

Haskelite Manufacturing Corp.
133 West Washington Street
Chicago, Illinois

Gentlemen:

Thinking possibly you may be interested in seeing them, we are sending you under separate cover a few pictures showing our new cars in service.

These new cars are the ones on which we used your products, HASKELITE and PLYMETL, and they are meeting our very satisfaction. We have been maintaining them very carefully and are well pleased with them. We are not making any other purchases this year but assure you if we were to do so we would specify your products in their construction.

Very truly yours,
L. J. De Lamar
Vice-President and General Manager

PLYMETL SIDE PANELS

HASKELITE

are repeating
Haskelite's
among
builders and
WATCH

HASKELITE MANUFACTURING CORPORATION
133 W. WASHINGTON STREET

Railway
Representatives: ECONOMY ELECTRIC DEVICES CO.
37 W. Van Buren St., Chicago

HASKELITE ROOFS



—to reduce
our operating expense"

THE Southern Ohio Public Service Company (Day & Zimmerman, Inc. Management) has operated 30 one-man cars on its Zanesville Ohio, city line since 1923 which were manufactured by the Kuhlman Car Company and equipped with the HASKELITE roofs and PLYMETL side panels. Note the letter from John W. Hewitt, General Superintendent.

Ask for detailed blue print booklet describing this money saving construction
HASKELITE MANUFACTURING CORPORATION
133 West Washington Street, Chicago, Ill.

Railway Representatives
Chicago Electric, Chicago, Ill.
St. Louis Car Co., St. Louis, Mo.
General Electric, Chicago, Ill.
Barnes & Fox, Chicago, Ill.
Tucker, Chicago, Ill.

PLYWOOD
HASKELITE
PLYMETL

PLYMETL SIDE PANELS

April 17, 1927.

Southern Ohio Public Service Company
133 West Washington Street
Zanesville, Ohio

Mr. James E. Fitzpatrick, Secretary

Gentlemen:

We have ordered on our Zanesville city line 30 one-man cars to be built by the Kuhlman Car Company. We have ordered on our Zanesville city line 30 one-man cars to be built by the Kuhlman Car Company. We have ordered on our Zanesville city line 30 one-man cars to be built by the Kuhlman Car Company.

The use of HASKELITE roofs and PLYMETL side panels will save the Kuhlman Car Company a great deal of money in the construction of these cars. We are well pleased with the results of the use of your products and we are sure that you will be well pleased with the results of the use of your products.

Very truly yours,
John W. Hewitt
General Superintendent

HASKELITE ROOFS



The York Railways,
York Pennsylvania put HASKELITE roofs and PLYMETL side panels in service 2 1/2 years ago. Note the attached letter from Mr. J. E. Wayne, Vice President and General Manager. "No body and maintenance." Send for lot of over 100 prominent users of HASKELITE PLYMETL or both and blue print booklet of applications to street car and bus construction.

HASKELITE MANUFACTURING CORPORATION
133 West Washington Street, Chicago, Ill.

Railway Representatives
Chicago Electric, Chicago, Ill.
St. Louis Car Co., St. Louis, Mo.
General Electric, Chicago, Ill.
Barnes & Fox, Chicago, Ill.
Tucker, Chicago, Ill.

PLYWOOD
HASKELITE
PLYMETL

PLYMETL SIDE PANELS

July 18, 1927.

Haskelite Manufacturing Corp.
133 West Washington Street
Chicago, Illinois

Mr. J. E. Wayne, Vice President and General Manager

Gentlemen:

We will undoubtedly be interested in the enclosed photograph recently sent me of your light weight suburban car built by the J. A. Brill Company in 1926.

HASKELITE and PLYMETL were used in the construction of these cars with "one body" service 2 1/2 years without expense for body maintenance.

Very truly yours,
J. E. Wayne
Vice President and General Manager

BACK COVERS

the story of
Preference
Leading
operators
THEM!

ING CORPORATION
ET, CHICAGO

ILWAY & POWER
ENGINEERING CORP.
Toronto, Ont., Can.

GRAYSON BROS.
600 LaSalle Building
St. Louis, Mo.
ERJ9-17 Gray

HASKELITE ROOFS

42 cars in 1924
25 cars in 1927

CITY AND COUNTY OF SAN FRANCISCO
DEPARTMENT OF PUBLIC WORKS
OFFICE OF THE SUPERVISOR
April 27, 1927

Haskelite Manufacturing Corporation
173 West Washington Street
Chicago, Illinois

Dear Sirs:

We are using Haskelite roofs on our cars, and we are very satisfied with the results. We believe that no more the pleasure in the use of Haskelite on street car roofs. With it we will not be giving accident satisfaction.

We believe that no more the pleasure in the use of Haskelite on street car roofs. With it we will not be giving accident satisfaction.

Yours very truly,
R. S. GRAYSON, JR.
City Engineer

Haskelite Manufacturing Corporation
173 West Washington Street
Chicago, Illinois

August 3, 1927

Dear Sirs:

I enclose herewith a photograph of one of the cars covered with Haskelite roof. The roof is very smooth and the material has remained in place for some time. I have a full set of the material for the car.

All of them are fitted with roof made of Haskelite. The roof is very smooth and the material has remained in place for some time. I have a full set of the material for the car.

Yours very truly,
R. S. GRAYSON, JR.
City Engineer

HASKELITE MANUFACTURING CORPORATION, 133 W. Washington Street, Chicago, Ill.
Coast Representative: California Panel and Veneer Company, 955 So. Alameda Street, Los Angeles, Cal.

ECONOMY ELECTRIC DEVICES CO., 37 W. Van Ness St., Chicago
RAILWAY & POWER ENGINEERING CORP., Toronto, Ont., Canada

HASKELITE ROOFS

over 500 cars in
HASKELITE was
from Mr. W. T.
anager. Ask for
HASKELITE or PLY
booklet of street

Pittsburgh Railways Company
Pittsburgh, Pa.

Dear Sirs:

Our experience with HASKELITE has been very satisfactory. It is a light and strong material and the light weight feature is a great advantage. It is a very good material and the light weight feature is a great advantage.

Yours very truly,
W. T. ...
Pittsburgh Railways Company

PLYMETL SIDE PANELS

HASKELITE

The Chicago Surface Lines say it with repeat orders

PLYWOOD
HASKELITE
PLYMETL

Haskelite Manufacturing Corporation
173 W. Washington Street
CHICAGO, ILLINOIS

First ORDER - HASKELITE roof made of Plywood and Plymetl.
Second ORDER - HASKELITE roof made of Plywood and Plymetl.
Third ORDER - HASKELITE roof made of Plywood and Plymetl.

The light weight and great strength of HASKELITE and PLYMETL are the reasons why they are so popular with the Chicago Surface Lines. They are a very good material and the light weight feature is a great advantage.

Yours very truly,
W. T. ...
Pittsburgh Railways Company

Of prove

Some
communities
served by
"Thomas-Built
Cars



Augusta, Ga.



Sheffield, Ala.



Miami, Fla.



New Orleans, La.

Augusta, Ga.
Helena, Mont.
Miami, Fla.
Durham, N. C.
Trenton, N. J.
New Orleans, La.
Hampton, Va.
Sheffield, Ala.
Danville, Va.
Greenville, S. C.

Value in any community

“Thomas-Built” Cars

If you judge cars on the basis of lower operating costs and increased passenger revenue, “Thomas-Built” Cars have certainly proved their worth.

At the same time their extreme safety, attractive appearance and unusual comfort make them a welcome asset in any community.

Note the list of prominent installations on the other page—typical of many more cities being served by “Thomas-Built” Cars.

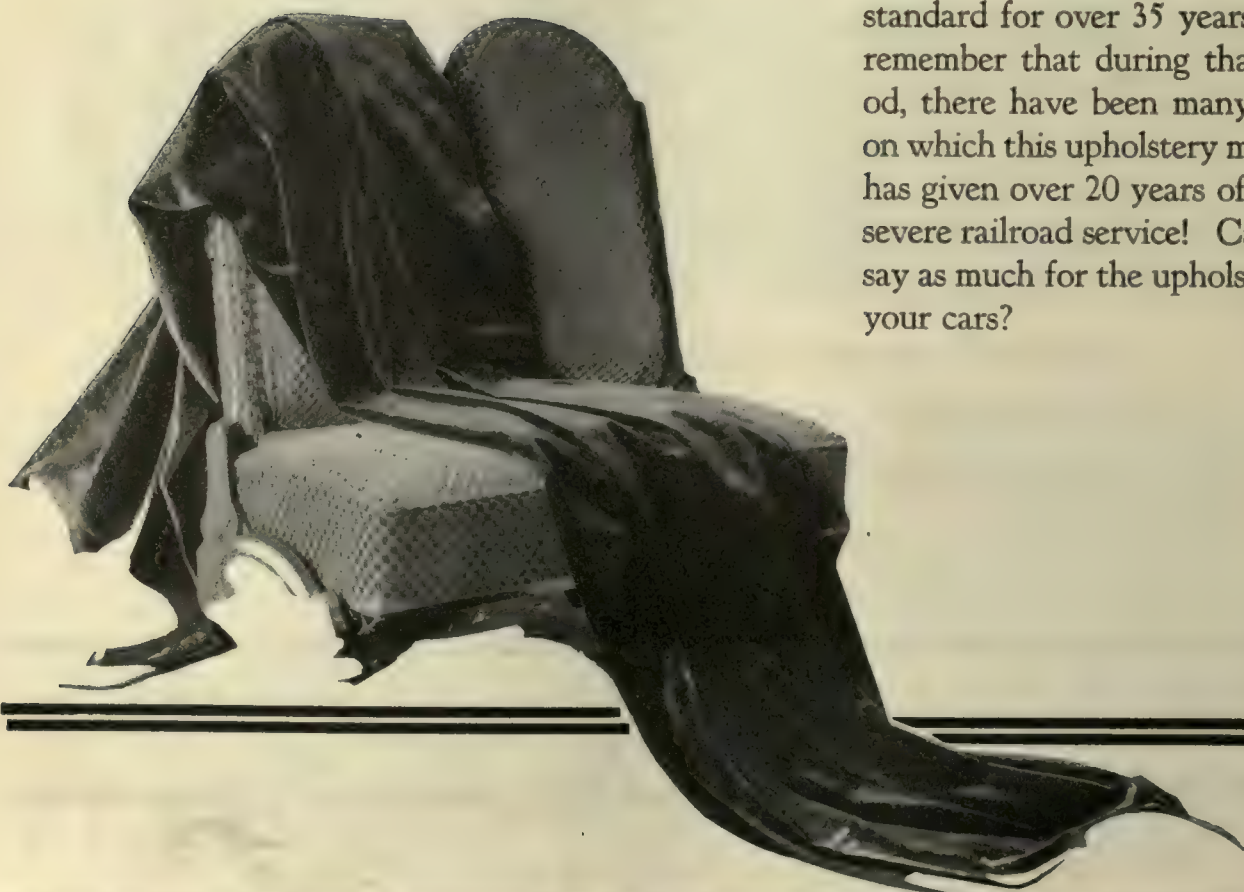
Let us demonstrate with figures what “Thomas-Built” Cars have accomplished on well-known electric railways—and what you may expect them to accomplish for you.

PERLEY A. THOMAS CAR WORKS

High Point, N. C.

Plush *still leads*

Another Electric Railway Convention at hand and plush still leading as the preferred upholstery material! Executives call for plush because, in the right patterns and colors, it is the most up-to-date material on the market. True, Massachusetts Mohair Plush has been the railroad standard for over 35 years! But remember that during that period, there have been many roads on which this upholstery material has given over 20 years of active severe railroad service! Can you say as much for the upholstery of your cars?





Illustrated here are but a few stock patterns of Massachusetts Genuine Mohair Plush. The photograph gives but a hint of their richness and beauty. See them for yourself and be convinced that we have a selection in keeping with the most luxurious car interiors. Visit our Booth at the A.E.R.A. Cleveland Convention or request us to mail samples and quotations.

You cannot buy a more economical seat covering, or one more easy to keep clean.

MASSACHUSETTS MOHAIR PLUSH CO.

Main Office: 80 Federal Street, Boston, Mass.

Makers of BAY STATE PLUSH

New York Agent:
Sisson Supply Co.
845 Grand Central Terminal
New York City

Western Agent:
Midgley & Borrowdale
1822 McCormick Building,
Chicago, Illinois.

MASSACHUSETTS MOHAIR PLUSH

The railroad standard for over 35 years



*Du Pont observes
a century and a quarter of usefulness
to the American People*

AN ANNIVERSARY can be either a point from which one looks backward, or a point from which one looks forward. Du Pont regards its 125th Anniversary as a point of *departure, not as a point of arrival*. Du Pont believes that its scope of usefulness calls for no yardstick of years past to measure it, because it is the years to come that will measure du Pont's largest usefulness.

Many new products have been offered to industry for the first time by du Pont. No product has ever been offered until painstaking chemical research has pronounced that product fit to bear the name du Pont.

DU CO · PAINTS · VARNISHES

E. I. DU PONT DE NEMOURS & CO., INC



KEEPS BRAKES FROM FREEZING

Brake failures from "Frozen Air" are eliminated with the Air Rectifier. It operates automatically, injecting alcohol and its vapor into the air pipes each time a brake application is made. This mixes with the moisture-laden air, thus lowering the freezing point and preventing the formation of frost.

Hundreds of cars are now equipped with Air Rectifiers—and are saving their cost many times over.

Johnson Fare Boxes

Johnson Full Electric Fare Boxes with electric overhead registers represent the very latest in scientific and low cost fare collection.

Any fare system in which the bulk of the adult fares is paid in one or two different coins, such as nickels, or dimes, nickels or tokens, dimes or tokens, or quarters or tokens can utilize the Johnson "Type J" full electric fare box. The two kinds of coins are counted separately, the individual totals showing on two separate registers. After counting, coins are available to the conductor for change making and tokens for resale.



McClosky Bomb Shell Torches

McClosky Torches are saving lives and thousands of dollars nightly for Railways on construction work. These Torches hold three quarts of oil—will burn from Saturday night until Monday morning and will remain lighted during the hardest wind and rain storm.



Cinch Swipe

This window wiper meets the dire need for an efficient device for cleaning the motorman's window. It can easily be installed on any type sash whether stationary or movable—and is extremely easy to operate.

ILLINOIS MOTIVE EQUIPMENT COMPANY

J. D. Elsom, Pres.

35 E. Wacker Drive, Chicago, Illinois

General Sales Agents, The Air Rectifier

MIDDLE WEST SALES AGENTS

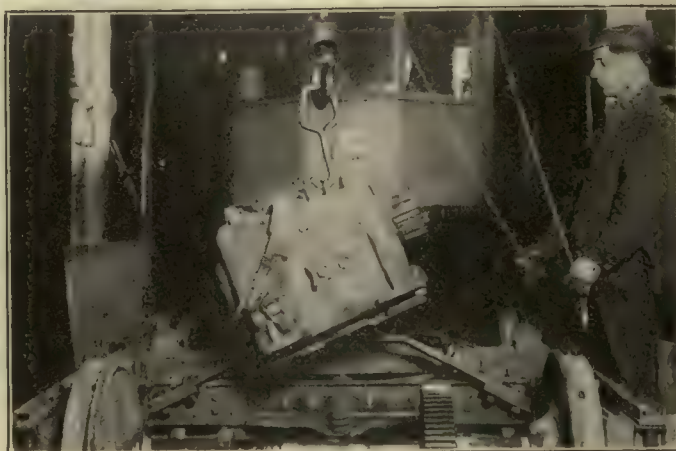
McClosky Bomb Shell Torches

Cinch Vertical Swipes

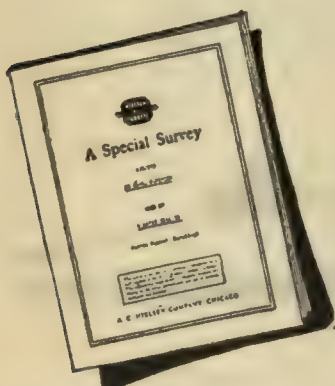
Johnson Fare Boxes

20,000
SKF

EQUIPPED
JOURNALS
IN WORLD-WIDE
USE



SKF-Equipped Journals and Motors Keep Cars Out of Shops and On the Road



Certified Survey No. 1887 in
your industry or one closely
related to it Sent on Request.

ONCE SKF Anti-Friction Bearings are installed on street car motors and journal boxes a big step has been taken toward reduced operating and maintenance costs—a vital factor with many street railway companies today! In addition, the smooth and easy riding qualities of SKF-equipped street cars are a strong factor in securing passenger good-will.

SKF Bearings mean less time in the shops and more time on the road earning profits. On journals they have a proven record of thousands of miles on the leading roads of the world. On motors they keep armatures in correct position always, eliminating electrical troubles usually caused by bearing wear. Lubrication is reduced to a twice-a-year detail.

SKF INDUSTRIES, INCORPORATED
40 East 34th Street, New York City

1887



**Ball
Bearings**

**Roller
Bearings**

CINCINNATI
BUILDS
for 1928

Setting a practical
standard to meet
the demand for
better transportation

The four features of Balanced Design are



The vindication of a principle adopted

Just six years ago the Cincinnati Car Co. adopted **BALANCED DESIGN** as a definite principle of modern car building.

Many questions were asked, and some doubts expressed. But the fact remains that during the past six years many of the most successful modernizations in the history of the industry have included cars built in accordance with this principle.

And in no single instance have



CINCINNATI

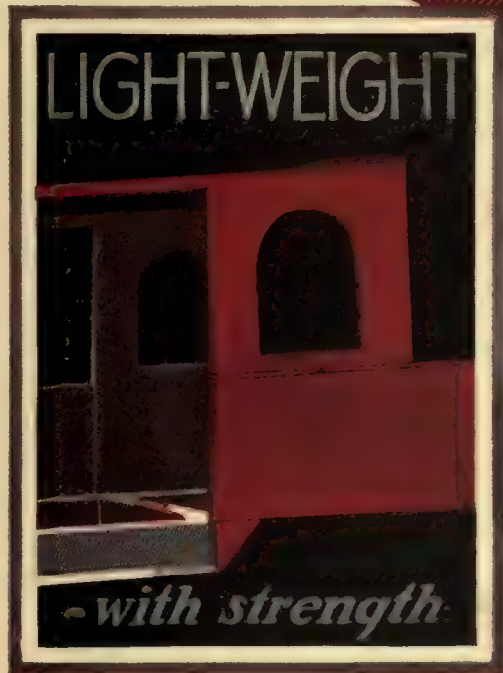
Cardinal Points of Today's Demand

A new car-building
years ago

Cincinnati Balanced Lightweight Cars
made anything but a profitable showing.

The reason is not far to seek.
BALANCED DESIGN aims to combine
lightness with strength; capacity
in comfort; speed with safety and
economy with low cost. These, after all,
are the cardinal points of today's
demand.

At the Convention you will have an
opportunity to judge for yourself. Be
sure to see the Cincinnati exhibits.



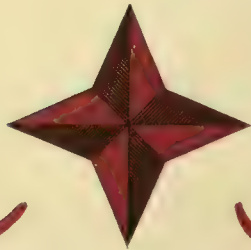
*— still a step ahead
of the modern trend!*

**BALANCED
LIGHTWEIGHT**

CARS

BALANCED DESIGN

has made these results possible
and Balanced Design
makes it easy for you
to get the right car
for your job—



Cincinnati has left no stone unturned in the effort to produce a car that will be **BALANCED** in every detail. Trucks are vitally important. And with long truck-building experience behind them, Cincinnati Engineers have produced some of the most radically improved truck designs of recent years.

This year, at the Convention, Cincinnati will exhibit a new truck that is far in advance of anything yet shown. Be sure to see this. Exhibit on track 2.

Cincinnati Balanced Design brings both the planning and building of modern cars under one competent supervision. No longer is it necessary to go to the expense of preparing your own detailed specifications, or to indulge in costly experimentation.

Working with tried and proved principles as a foundation, Cincinnati engineers can help you to design cars exactly suited to conditions on your property. There will be no guesswork, no hide-bound adherence to out-of-date conventions, no added afterthoughts. It will be possible to predict operating results with every reasonable certainty.

We believe you will find it both easier and more economical to visualize your plans this way. Consult us.

CINCINNATI BALANCED LIGHTWEIGHT CARS

"This company
certainly uses
mighty good
trolley cord—it's
SAMSON SPOT CORD."



Trade Mark Reg. U. S. Pat. Off.

SAMSON SPOT TROLLEY CORD

The colored spots identify Samson Spot Trolley Cord—but superior service has made it famous. This cord is especially made for long, hard service, and its spectacular performance has endeared it to electric railway men. Smoothly braided, pliable, waterproofed, uniform in thickness, guaranteed free from rough places, Samson Spot Cord runs freely in any weather. Does NOT kink, swell or shrink and wears "like iron." Cost? Well, considering the better and longer service delivered, it's the cheapest cord you ever bought.



SAMSON BELL AND REGISTER CORD

You can buy Samson Bell and Register Cord with absolute assurance that it is of the same high quality and manufactured with the same care as Samson Spot Trolley Cord. Its neat appearance and finish match the finest of car interiors. It resists abrasion. Can be supplied in any reasonable size or length, in white, mahogany or drab—other colors to order.

Samson Signal Cord with galvanized wire center is made in mahogany color, sizes No. 6 and No. 8.

Samples on Request.

SAMSON CORDAGE WORKS

88 BROAD STREET

BOSTON, MASS.

TRADE



MARK

Strict economy in Modern Car Operation thru More-Jones quality

THIS organization has, for more than a half a century, given traction problems careful study and knows the quality of equipment necessary for the growing needs of modern car operation.

Purchasers of More-Jones Quality Products enjoy complete confidence in our uniform products and our ability to always lead in new engineering practices.

More-Jones Quality Products cut down maintenance requirements, and make better service possible. Net earnings show the value of More-Jones Quality Products. Uniformity is one of the outstanding features of these products.

For reason of economy and better service, consider More-Jones Quality Products for your requirements.

Let us give you further information and prices.

NATIONAL BEARING METALS CORPORATION
St. Louis, Mo.

More than 50

Economy

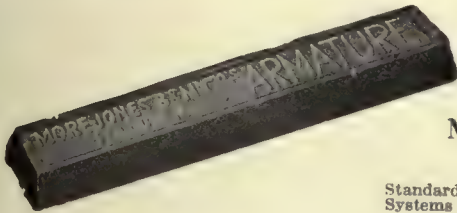
"Tiger" Bronze Axle and Armature Bearings

The Lead content, that we scientifically incorporate into this alloy, minimizes frictional wear, resulting in less frequent replacements. Finished oversize or undersize to a perfect running fit with your shafts.

Expertly machined in strict accordance with your specifications, even to the extent of incorporating special features therein, if so desired.

All Armature Bearings lined with our celebrated ARMATURE Babbitt Metal.

"Tiger" Bronze Axle and Armature Bearings insure maximum service under the hardest operating conditions.



More-Jones Armature Babbitt Metal

Standard on the majority of Electric Railway Systems in this country.

Specially formulated for the exacting requirement of Electric Railway Armature Bearing maintenance.

Its high heat radiation minimizes friction, even under the most trying circumstances.

A trial is the most conclusive proof of its superior inherent characteristics.



More-Jones Trolley Wheels

They are finished and bored in one operation, thus insuring proper balance.

The Metal used is exceedingly tough—an alloy of purest new metal, having maximum conductivity—which provides greater mileage without damage to the overhead lines.

V-K Oil-less Wheels for City and Suburban service and More-Jones lubricated Wheels for high speed requirements insure lowest ultimate cost.



MORE-JONES QUALITY PRODUCTS

Years of Service



THE CLEVELAND FARE BOX CO.

4900 LEXINGTON AVENUE

CLEVELAND, O.

W. T. COOK, [PRESIDENT]

W. SHAW, [VICE] [PRESIDENT]

V. G. ROSS, TREASURER

MANUFACTURING DISTRIBUTORS

"STEEL-STRONG"
COIN AUDITING MACHINES

MATTHEW'S
TOKENS

"RAPID READY"
CHANGE CARRIERS

"4-WAY"
PADLOCKS

Mr. Railway Executive:

Cleveland, the Convention City, "easily reached from almost everywhere," again welcomes you to the A.E.R.A. Convention. Last year you undoubtedly enjoyed the friendly spirit of its people, its beauty and progressiveness and were interested in its diversified industries. The same friendly spirit will prevail this year.

Our part of "Meeting the Demand for Better Transportation" is to efficiently collect, protect and audit your fares—our best thought is being put into this problem at all times with the result that we were never in a better position, than at the present time, to take care of your fare collection requirements.

You will find us in Space 270 waiting to talk over that fare collection problem of yours—we may be able to give you its solution. A full line of Cleveland Fare Boxes, "Steel-Strong" Coin Auditing Machines, "Rapid-Ready" Change Carriers, Matthew's Tokens and Four-Way Padlocks will be on display.

Have your delegate talk to us about the refinements and improvements on our fare box locks and coin auditing machines.

Our Canadian Branch Manager will be on hand to welcome delegates from that country.

Cordially yours,

THE CLEVELAND FARE BOX CO.

WS:AJM



For increased revenue add MORE COMFORT

THE COMFORTABLE transportation which privately owned automobiles provide has made considerable inroads on street car revenue. But progressive properties, having made a study of the situation, are today matching this service with better, more comfortable riding cars, and are winning new and holding old patrons.

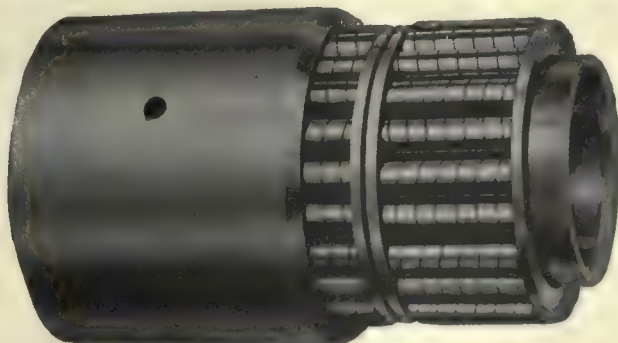
The out-of-date public conveyance is rapidly giving way to the modernized street car. This new type car with all the latest improvements and appointments naturally has anti-friction bearing journal boxes. This most necessary item in all modernization programs—the Hyatt Roller Bear-

ing—adds that smoothness and ease of operation which pleases patrons and increases revenue.

In addition to this required quality, Hyatt Roller Bearings justify their use from an economic standpoint by making possible quicker acceleration, reduced oiling and maintenance expense, and lower peak load power demands.

Hyatt Roller Bearings have been proved through actual service on inter-urban and street railways in all sections of the country. Send for details and performance records.

HYATT ROLLER BEARING COMPANY, Newark, Chicago, Detroit, Pittsburgh, Oakland
The Canadian Fairbanks Morse Company, Ltd., Distributors of Hyatt Railway Bearings in Canada



Visit Hyatt Booths
651 and 653 at the
convention.

The Hyatt Roller Bear-
ing used in Electric
Railway service.

HYATT

ROLLER BEARINGS

PRODUCT OF GENERAL MOTORS

The Judge in the



and gives Mr. To
work in

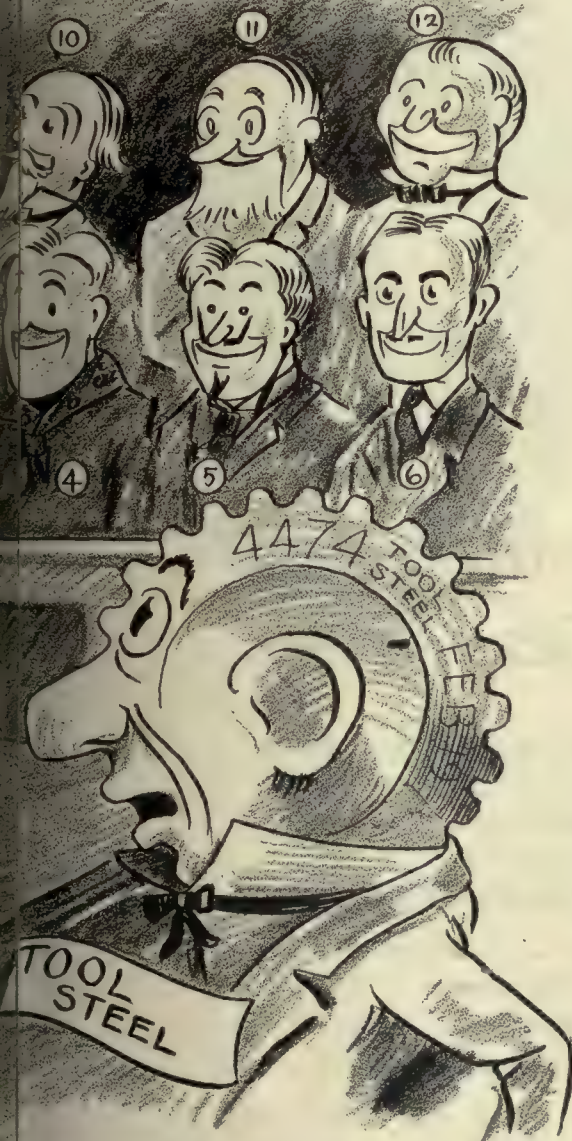


The Standard of Quality

TOOL GEAR

renders a verdict of "Guilty" case of Mr. "Tool Steel" Gear

The Judge Hears the Report of the Jury—

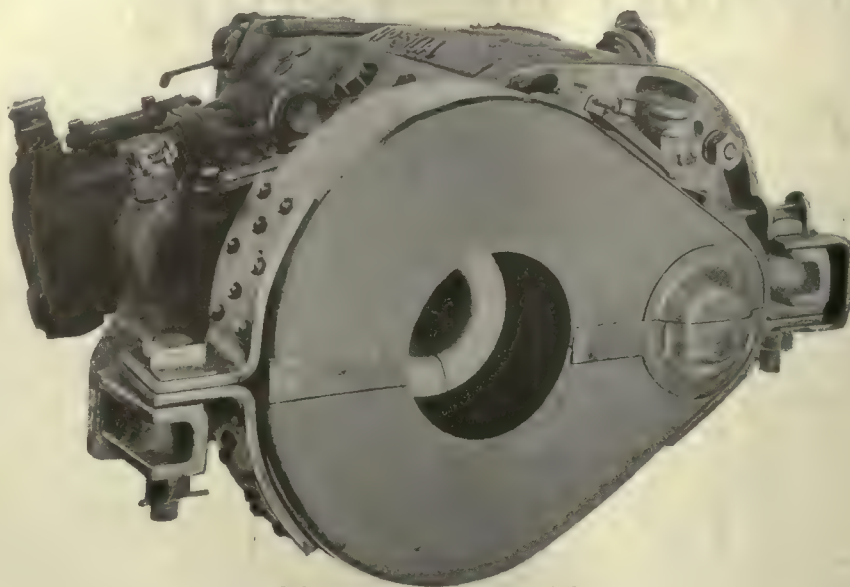


1. A.E.R.A. Equipment Committee—82% are "Tool Steel" gear users.
2. A.E.R.A. Question Box finds "Tool Steel" best.
3. Electric Traction Trophy Winner used "Tool Steel" gears in winning car.
4. Western Canada is unanimous in favor of "Tool Steel" gears.
5. Europe says no other American manufacturer touches "Tool Steel."
6. South America is almost exclusively "Tool Steel."
7. Australia is buying "Tool Steel" heavily for new British made motors.
8. Ohio, the home state, is practically unanimous in selecting "Tool Steel."
9. C.E.R.A. Master Mechanic Officers are 82% "Tool Steel" users.
10. Southern Equipment Men praise "Tool Steel" highly.
11. Holland specifies "Tool Steel" gears when buying German motors.
12. A.E.R.A. Equipment Committee Questionnaire answers were from Companies, 88% of whom used "Tool Steel" gears.

The Tool Steel Gear & Pinion Company
Cincinnati, Ohio

"Tool Steel" Gear a life sentence of hard
continuous service.

STEEL QUALITY
AND PINIONS



W. H. 510-A Motor

This is about Cash Fares and Gear Cases

How many of your cars find their way into the repair shop—and how often—because of gear trouble? How many cash fares would be rung up on their registers if they were to be left in the cars during the repair period? What is the total of idle capital represented in gear trouble lay-ups?

If you will visit us at Booth 616 at the Convention, we will be glad to go into the question of Chillingworth Drawn Steel Seamless Gear Cases and show you how closely they are tied up with cash fares, and gear protection.

Note their rivetless construction—one piece with overlapping joint between the halves. Dust cannot enter. Grease cannot escape. There are no parts to weaken—no seams to open. They are light and tough.

Ask a user.

Chillingworth Manufacturing Co.

Jersey City, N. J.

Representatives:

J. W. Gerke
New York

Tool Steel Gearing & Equip. Co.
England

Railway & Power Eng. Co.
Canada



Griffin Wheels

with
Chilled Rims
and
Chilled Back of Flanges

From the standpoint of both
Economy and Safety
THE CHILLED IRON WHEEL
is the ideal wheel for
ELECTRIC RAILWAY SERVICE

GRIFFIN WHEEL COMPANY

410 No. Michigan Ave.

Chicago, Ill.

Foundries:

Chicago
Tacoma

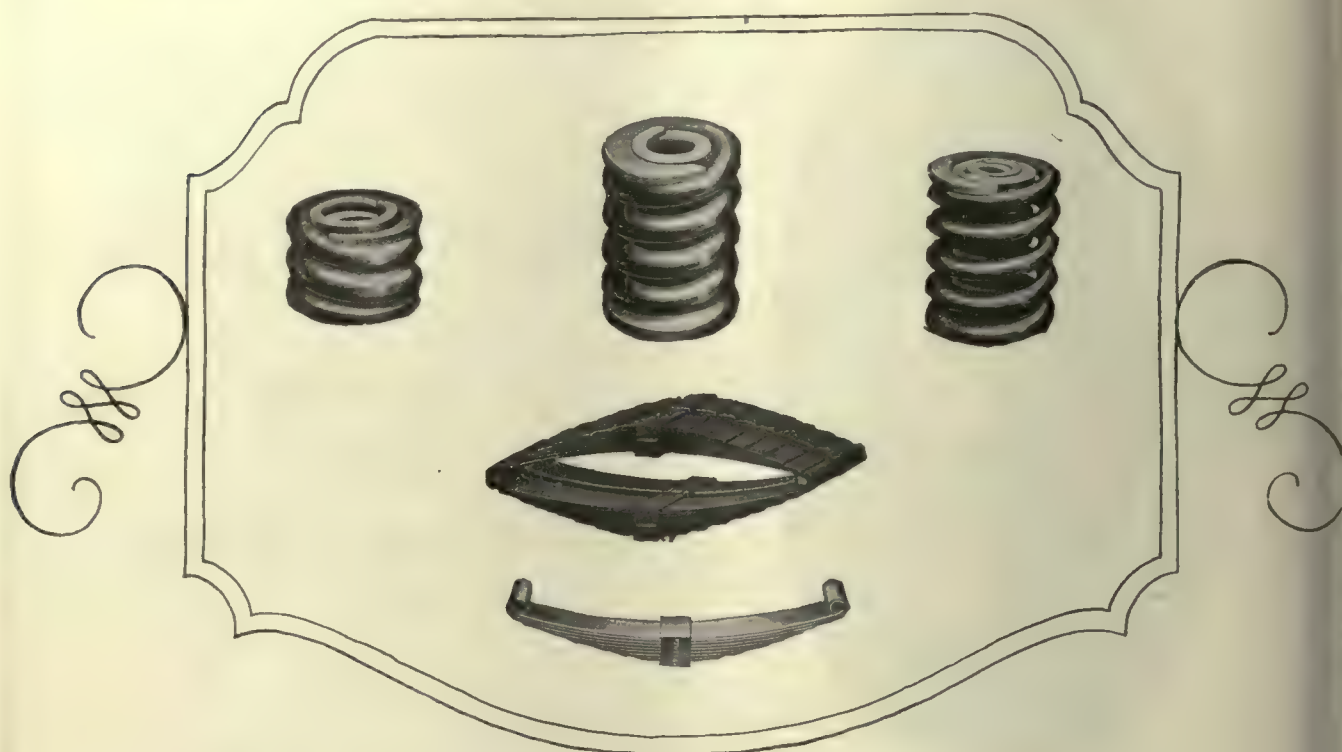
Detroit
Kansas City
Cleveland

Denver
Los Angeles

St. Paul
Salt Lake City
Cincinnati

Boston
Council Bluffs

Serve your community!



TO provide quiet, comfortable-riding cars is one way in which you can serve well your community. And by doing so you will reap the benefits of increased patronage—which means increased profits.

For more than 20 years "Fort Pitt" Springs have accomplished this on leading electric railways. So you may be sure they will do the same for you.

Among our many items are full elliptics for car trucks; half elliptics for locomotives and cars; special types of quarter, half and three quarter elliptics for electric railway service; drawbar springs; equalizer springs; and extension springs.

*Send for our Catalog and Specification Book.
Quotations on request. Prompt shipments guaranteed.*

Fort Pitt Spring & Manufacturing Co.
Pittsburgh, Pa.

FORT PITT

50 Plants—Daily Capacities 20,000 Wheels



A. R. A. Standards

650-lb.

Wheel for
30-ton cars

700-lb.

Wheel for
40-ton cars

750-lb.

Wheel for
50-ton cars

850-lb.

Wheel for
70-ton cars

Tread Hardness

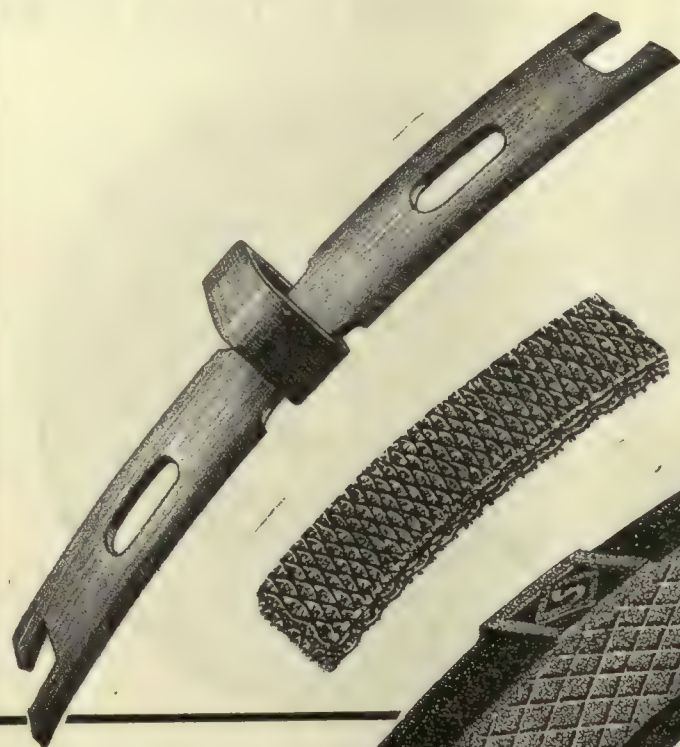
The chilled tread will not crush or flow under the heaviest loads. It is the hardest usable metal known. Yet, the hubs are soft, insuring a strong and perfect axle fit.

Better Every Year

A slogan and a fact based upon definite laboratory and foundry programs.

*Have you investigated the
new design single plate
Chilled Tread Wheel?
Over 100,000 in service.*

ASSOCIATION OF MANUFACTURERS OF CHILLED CAR WHEELS
1847 McCORMICK BUILDING • CHICAGO
A. E. R. A. Convention Booth No. 268



1 Steel back reinforcement holds shoe together in case of cracking and preserves full efficiency through all stages of wear.

2 Bundle of expanded metal embedded in the body of the shoes and extended into the chilled ends to increase durability and friction.

3 The proper combination of these elements produces a shoe which not only delivers more foot pounds of work but which can easily outlast four or five shoes lacking in these features of construction.

Learn

the "INSIDE

"Best by Test"

EXTERNALLY a brake shoe is a dull uninteresting object. But a *properly made* brake shoe has an "inside story" which the railway operator finds as interesting as it is important. There are still, however, those who are unfamiliar with this "inside story" and who look upon a brake shoe simply as a necessary "hunk of metal." With this viewpoint, it is difficult to increase braking efficiency or reduce brake shoe cost. Our engineers will, therefore, be glad to discuss the "inside story" of a brake shoe with all who visit the American Brake Shoe and Foundry Company's Exhibit at Cleveland.

Why a Brake Shoe is NOT "Just a Hunk of Metal"

IF simply a by-product, made to utilize left-over foundry iron, a brake shoe *can* be "just a hunk of metal." As produced by the American Brake Shoe and Foundry Company, however, it is a specialized and highly *organized* piece of iron with a bevel-edged steel backbone, sinews of expanded metal and chilled ends which combine and work together to deliver more foot pounds of work and to stop cars or trains efficiently and safely at the lowest brake shoe cost.

STORY" of a Brake Shoe

When in
CLEVELAND

Visit

Space 226
Section B

**THE AMERICAN BRAKE SHOE
AND FOUNDRY COMPANY**

30 CHURCH ST., NEW YORK
332 SO. MICH. AVE., CHICAGO

STANDARD FOR SAFETY AND SERVICE

Ask U

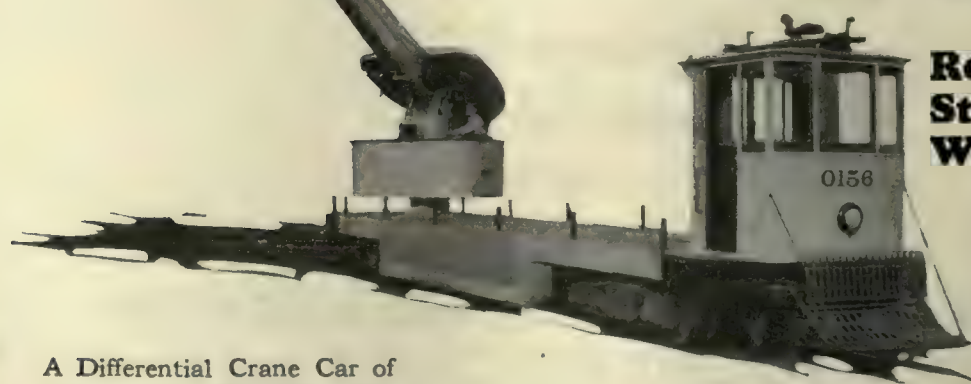
See Our Exhibit
SPACE
267
CLEVELAND

**Steel
Axles**

**Steel
Springs**

**Armature
Shafts**

**Rolled
Steel
Wheels**



A Differential Crane Car of the Cleveland Railway Company equipped with "Standard" Rolled Steel Wheels.





The "Cleveland Limited" of the Northern Ohio Traction and Light Company equipped with "Standard" Rolled Steel Wheels.

"Why" in Cleveland—

AS will be emphasized at the Convention, modern street cars are the safest and most serviceable of vehicles. It is fitting, therefore, to equip such carriers with the safest and most serviceable parts. Visit our exhibit in Cleveland and Standard Steel Works Engineers will be glad to tell you how control of all operations—from selection of raw material to completion of each finished product—has made "Standard" Steel Wheels, Springs, Axles and Armature Shafts the safest and most serviceable wearing parts known to modern railway operation.

Steel
Axles

Steel
Springs

Armature
Shafts

Rolled
Steel
Wheels

STANDARD STEEL WORKS COMPANY

Philadelphia, Pa.

CHICAGO
ST. LOUIS
NEW YORK

BRANCH OFFICES
HOUSTON
PORTLAND
RICHMOND
MEXICO CITY

SAN FRANCISCO
ST. PAUL
PITTSBURGH

WORKS: BURNHAM, PA.





ROL-MAN

Truck and Car Parts

for Brooklyn and Manhattan Transit and
Philadelphia Broad Street Subway Cars

Repeated shocks under heavy loads. Continuous grinding wear under heavy pressure. Little or no lubrication. These are the causes of rapid depreciation of truck and car parts, with a consequent loss of service, labor and revenue due to repeated pull-ins for repairs and renewals.

This is an efficiency age and efficiency means economy. It is not difficult to figure savings in dollars by the use of ROL-MAN parts to avoid the above losses.

For several years past, the Brooklyn-Manhattan Transit Corporation has used ROL-MAN Manganese Steel truck and car parts for replacement of carbon-steel in existing equipment, such as pedestal and journal box liners, bolster and transom chafing plates, and similar parts where excessive wear had occurred.

The sixty-seven three-car articulated units recently built for the B.-M. T. represent a great forward step in development of transportation. As a result of their past experience with ROL-MAN every point of abrasive or frictional contact on these cars is protected with ROL-MAN Manganese Steel Wear Plates. The total movement between journal boxes and pedestals is limited to 1/16 in. in either direction and it is a significant fact that the liners on these parts and nearly all others are face riveted in place. This, in the light of their past experience, as this road has never removed a manganese steel plate when once applied.

The Philadelphia Rapid Transit Co. has also made test installations of ROL-MAN and as a result the 150 cars now being built for the new Broad Street Subway are fully protected against wear by the most extensive use of ROL-MAN parts made to date.

ROL-MAN parts are long-lived because they resist wear. In fact, their resistance to abrasion actually increases as they become toughened and hardened under repeated impact and friction. Consequently, they last for years and require a minimum of attention. Think what that means to you in keeping your cars out on the lines earning dividends rather than in the shops eating up profits.

You will notice, too, since the wear on ROL-MAN Parts even over a period of years is almost imperceptible, that cars equipped with them have less vibration and consequently operate with much less noise.

A request from you will bring our Engineer of Railway Equipment to discuss the possibilities with your Mechanical people.

ROL-MAN PARTS

Journal Box and Pedestal
Gibs or Liners
Bolster and Transom
Chafing Plates
Bolster Hanger Wear Plates,
Axles and Supports
Bolster End Wear Plates
Side Bearing Wear Plates
Brake Rod Chafing Plates
Buffer Wearing Plates
Sector Bar Liners
Draw Bar parts for car
bodies
Motor Nose Bearing and
Wear Plates

You are invited to
visit our exhibit in
booth No. 322 at the
A.E.R.A. Convention,
Cleveland, October
3rd to 7th. Samples
of ROL-MAN Man-
ganese Steel truck
and car parts in ser-
vice on various steam
and electric railways
will be exhibited for
your inspection.

USED BY

Brooklyn-Manhattan Tr. Corp.
Denver Tramway Corp.
Erie Railroad Co.
Hudson & Manhattan R. R. Co.
Indianapolis St. Railway Co.
Newport News & Hampton Rwy.,
Gas & Electric Co.
New York Rapid Transit Corp.
Phila. Rapid Transit Co.
Sacramento Northern Railway Co.
Steddenville, East Liverpool &
Beaver Valley Traction Co.
Pacific Electric Railway Co.
Houston Electric Company
Eastern Mass. Street Railway Co.
Washington, Baltimore &
Annapolis Electric R. R. Co.
Phila. Broad St. Subway
Illinois Power & Light Corp.
West Penn Railways

MANGANESE STEEL FORGE CO.

Richmond St. and Erie Ave.

Philadelphia, Pa.

MANUFACTURERS OF ROL-MAN ROLLED MANGANESE STEEL PRODUCTS

NEW YORK
30 Church St.

CHICAGO
Old Colony Bldg.

PITTSBURGH
Oliver Bldg.

LOS ANGELES
320 S. San Pedro St.

DETROIT
Lexington Bldg.





THE COMFORTABLE
PATRONS ARE YOUR
REVENUE SOURCE.
KEEP THEM COSY
WITH

GOLD'S Electric Heaters and Automatic Control

For your convenience we
exhibit at booths 222-224 the
most complete display of elec-
tric heaters and controls ever
shown.

Gold's Electric Heaters
may now be obtained with
either open coil or enclosed
Elements

*Include Gold in Your
Specifications.*

You Will Profit By It.



Open Coil Type of Element

— NOTE —

Our new catalogue just
off the press contains
data developed from
our study of enclosed
elements.

If you have not re-
ceived your copy write
for it.



Enclosed Type of Element

GOLD CAR HEATING & LIGHTING CO.

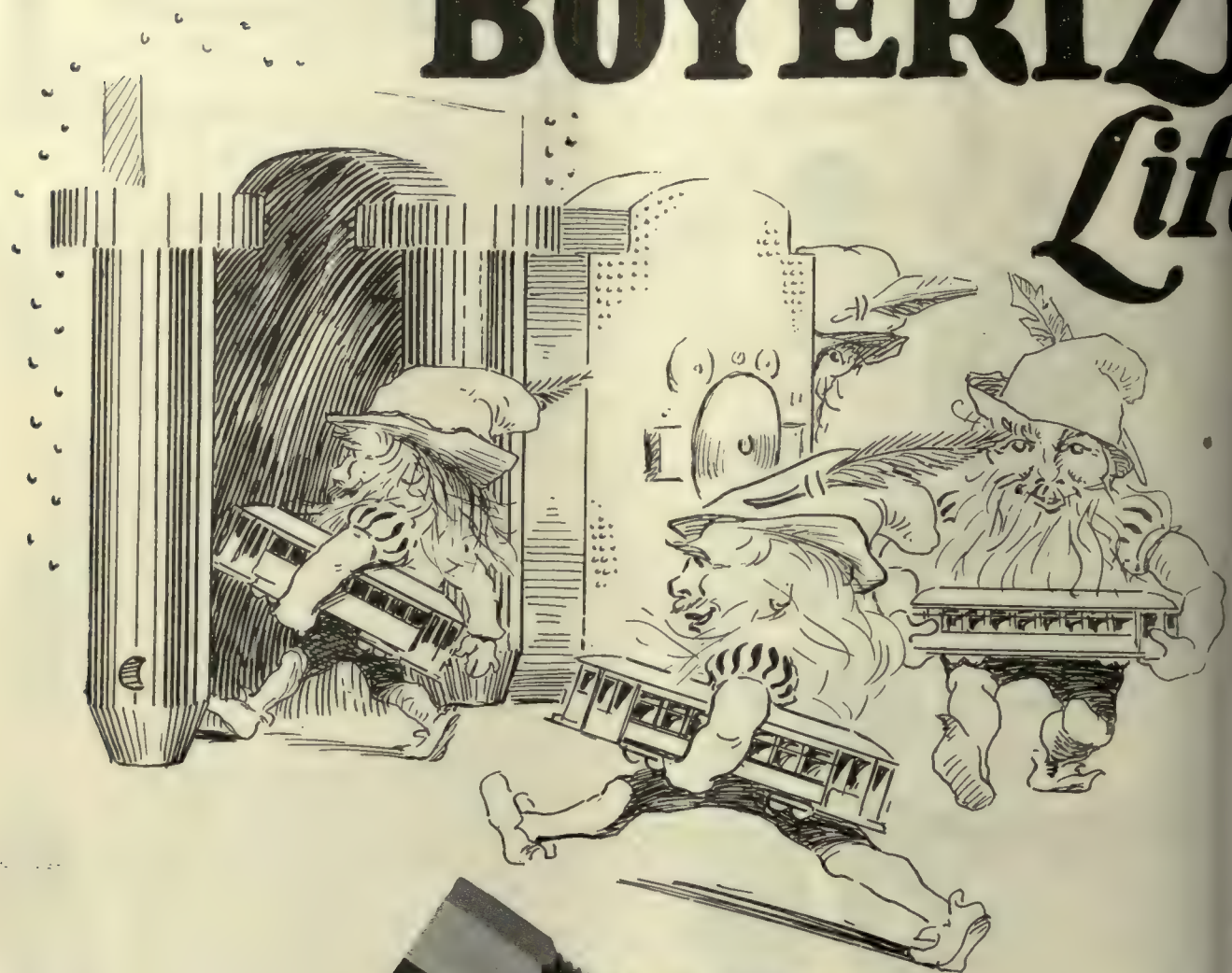
220 36th STREET

(Bush Terminal)

BROOKLYN, N. Y.

346 St. James Street, Montreal, Canada

BOYERIZI *Life*



and safeguard the of modern Cars!

THOSE modern cars! Certainly they will increase business, good-will and earnings! But will they keep maintenance costs down over a period of years? Will they stand-up under the severe service strains to which they will be subjected? Think of the jarring and grinding of sudden stops—the hardest knocks of brake service on any cars!

If they are equipped with BOYERIZED parts they will! In a nutshell, Boyerizing gives car parts a life equal to three or four times that of ordinary steel. Yet their cost is low!

BOYERIZE one or more cars for a test. Keep an accurate record of comparative cost and performance—then figure the actual results yourself. You will be convinced that to Boyerize is to Economize.

Write *now* for detailed information and quotations. Or pick from the list such Boyerized parts as you may need immediately and let us ship you a trial order.

BEMIS CAR TRUCK COMPANY

Electric Railway Supplies

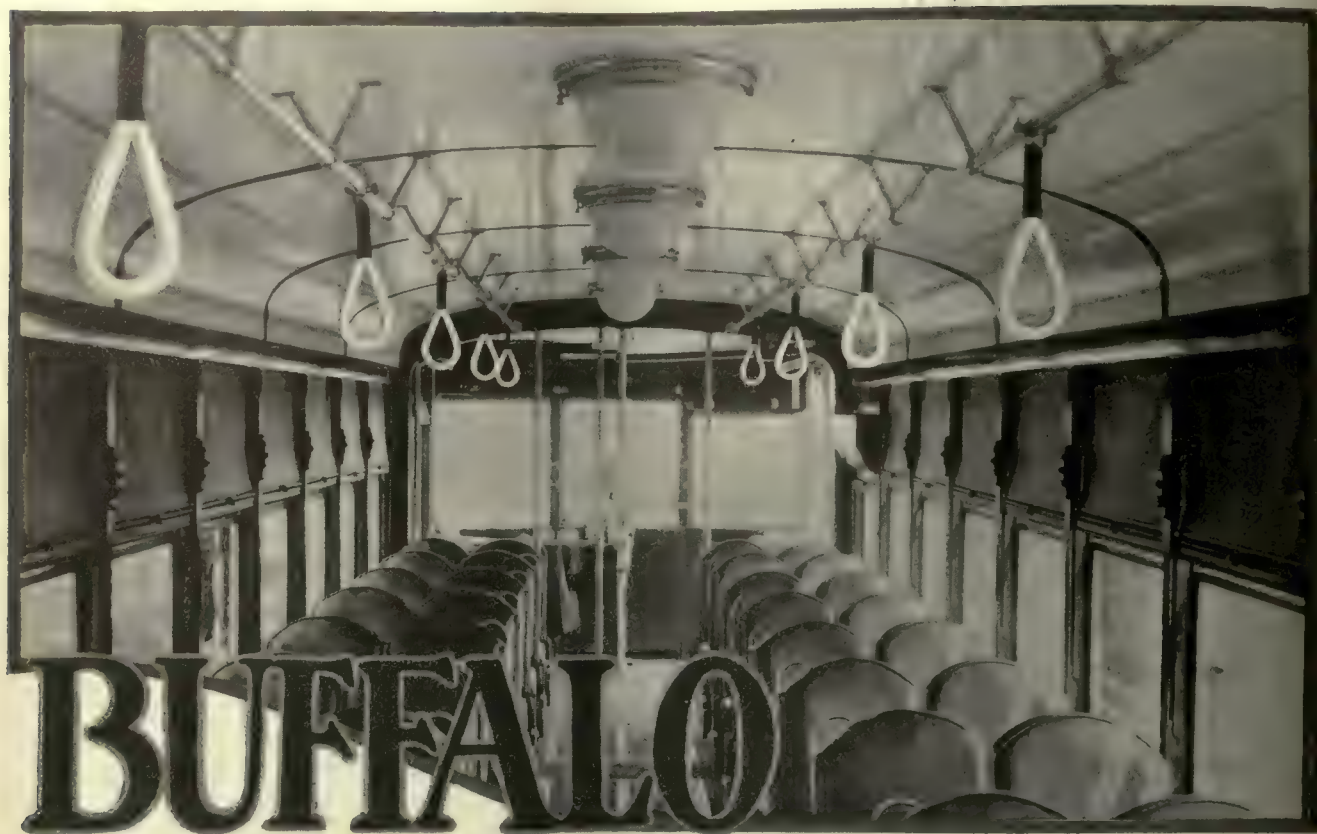
Springfield, Mass.

REPRESENTATIVES:

Economy Electric Devices Co., Old Colony Bldg., Chicago, Ill.
F. F. Bodler, 903 Monadnock Bldg., San Francisco, Cal.
W. F. McKenny, 54 First Street, Portland, Oregon
J. H. Denton, 1328 Broadway, New York City, N. Y.
A. W. Arlin, 519 Delta Bldg., Los Angeles, Cal.

Brake Pins
Brake Hangers
Brake Levers
Pedestal Gibs
Brake Fulcrums
Center Bearings
Side Bearings
Spring Post Bushings
Spring Posts
Bolster and Transom Chafing Plates
Manganese Brake Heads
Manganese Truck Parts
Bushings
Bronze Bearings
McArthur Turnbuckles





Hand-Hold for eliminating loading and unloading delays

Buffalo Hand-Holds on car exhibits of Northern Texas Traction Co. and Houston Electric Co. at Booth 105

Buffalo Hand-Holds enable passengers to walk through moving cars before arriving at stop, thereby speeding up schedules. In meeting the demand for better transportation they are a necessity.

We also manufacture and will exhibit at Cleveland stamped, stainless steel, brass, bronze, and aluminum seat handles.

Visit our exhibit at the Convention and also the cars equipped with Buffalo Hand-Holds. Then let us quote on your next requirements.

**A.E.R.A.
Convention
Booth
116**

**NATIONAL RAILWAY
APPLIANCE
COMPANY**

Chicago, Boston, New York,
Washington

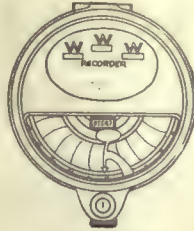
Selling Agents: Grayson, Hageman & Castle

CENTRAL EQUIPMENT COMPANY

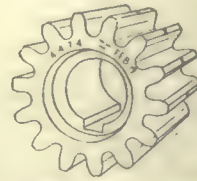
800 Englewood Ave., Buffalo, N. Y.



Economy Meters



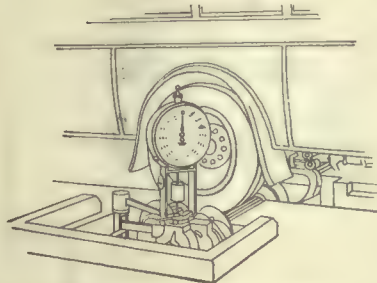
Recorders



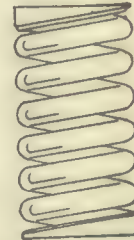
Tool Steel
Gears and Pinions



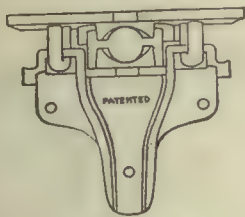
Anderson
Automatic
Slack Adjusters



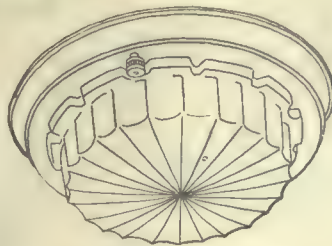
Cowdrey Brake Testers



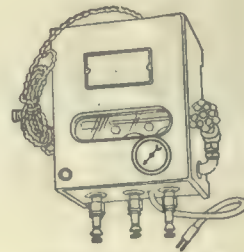
Ft. Pitt Springs



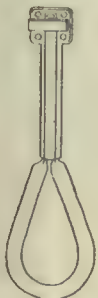
Harper Motor
Coach Hangers



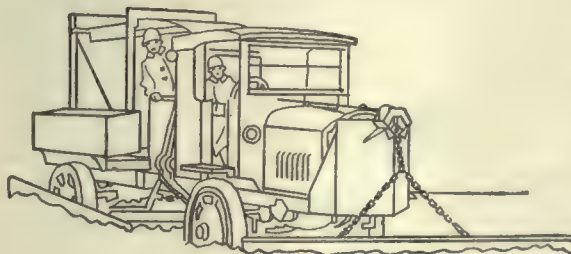
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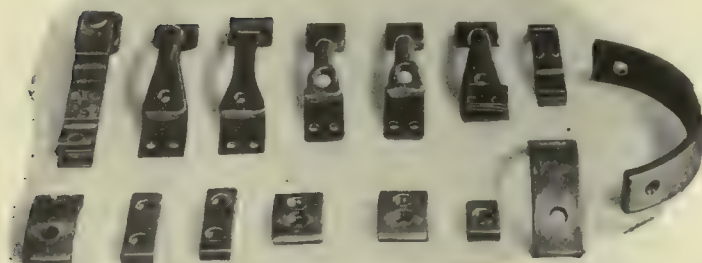
See Booths 116-117 at A. E. R. A. Convention, Cleveland



COLUMBIA—



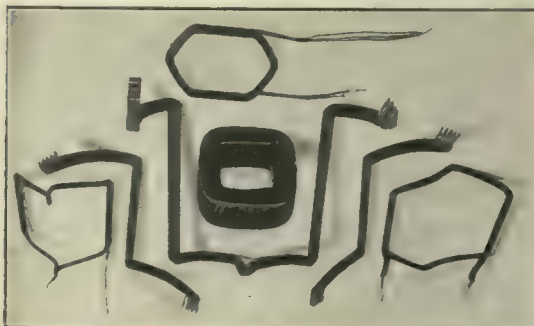
Columbia No. 1—an especially developed bearing bronze—gives Columbia Armature, Axle and Journal Bearings the long wearing qualities that have made them standard equipment on many of the leading roads.



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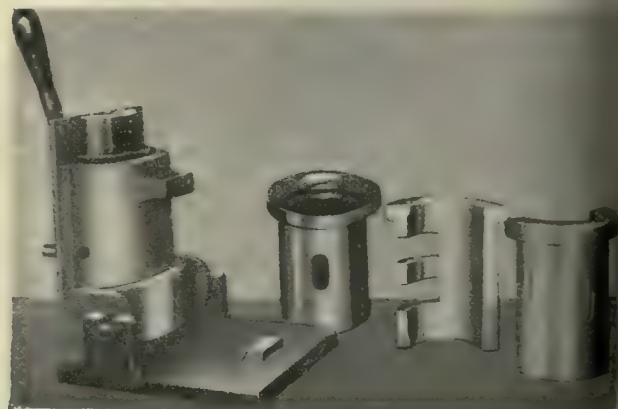
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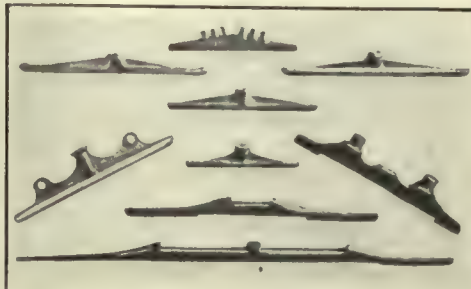
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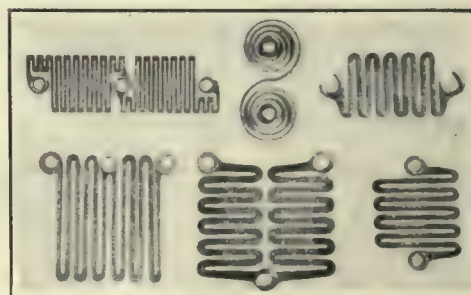
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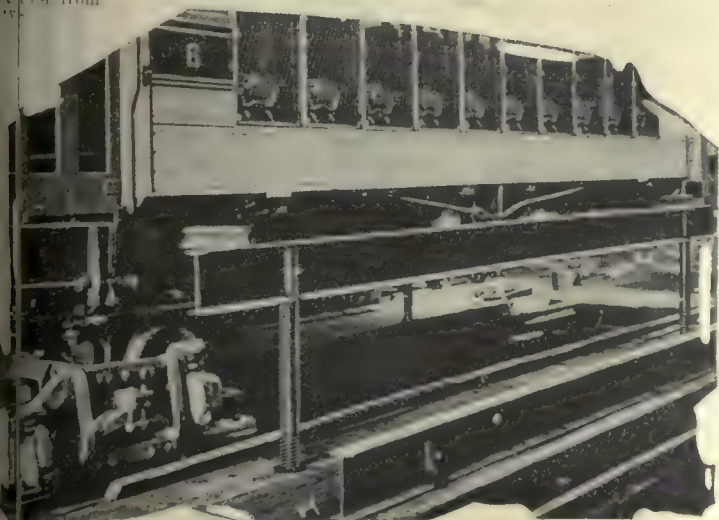
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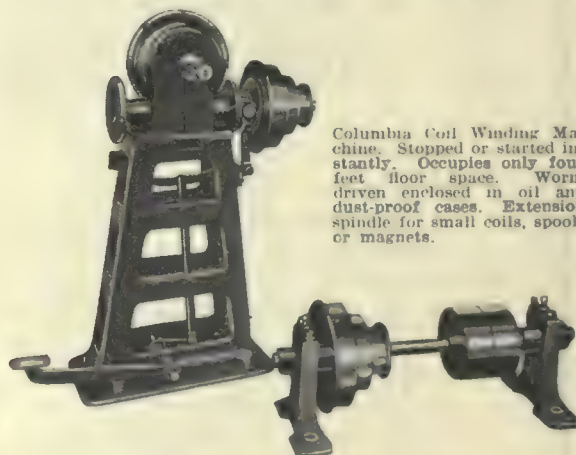
Columbia resistance grids are applicable to all standard resistors. Their great strength eliminated sagging, breakage and warping from overloads. The grids are aluminum unless otherwise specified.



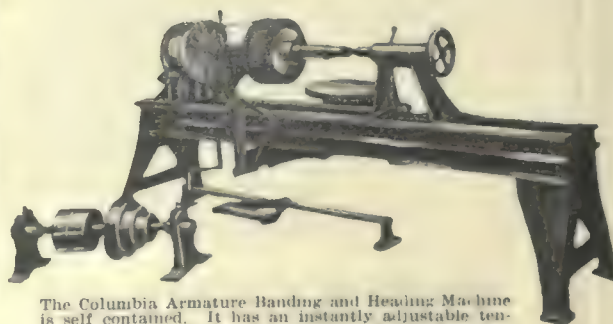
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solutely oil-
tight, and
bottom
of flanged
sides and
ends with
protect bent
sides to
remove all
from



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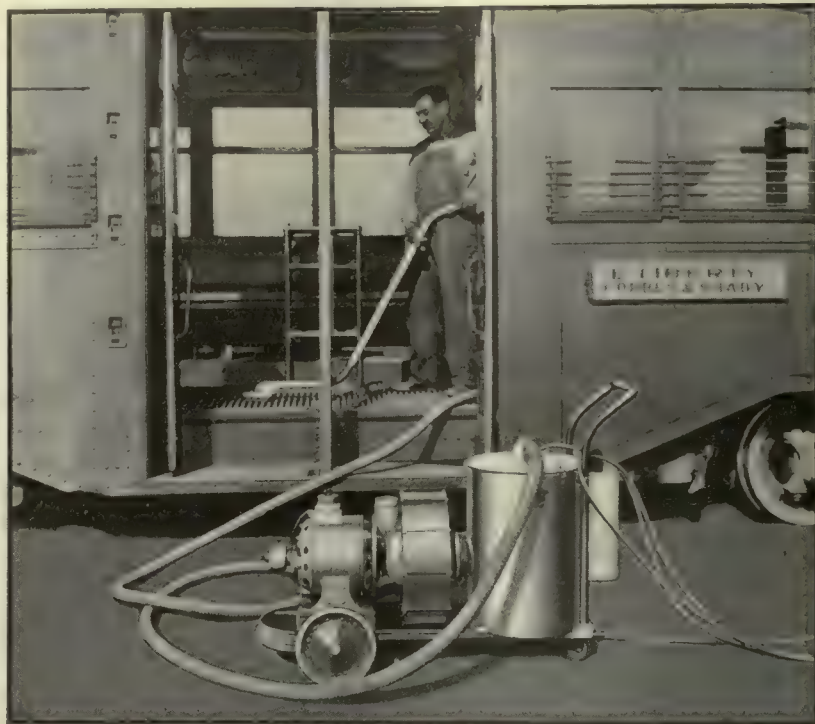
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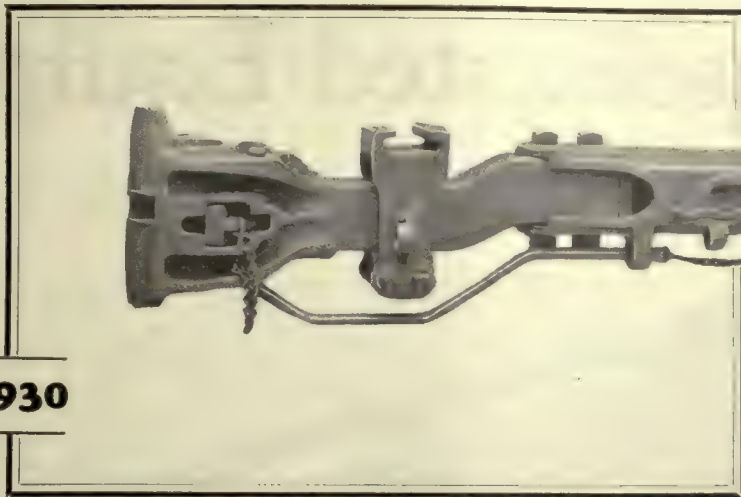
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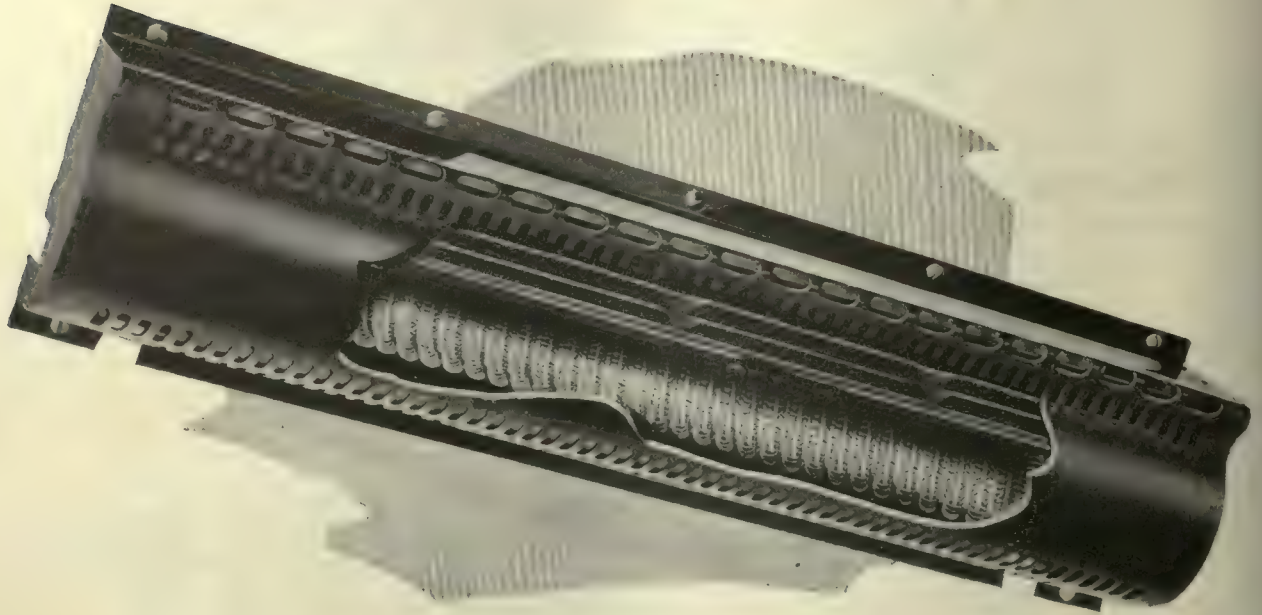
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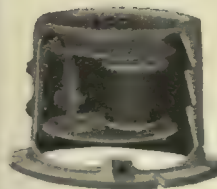
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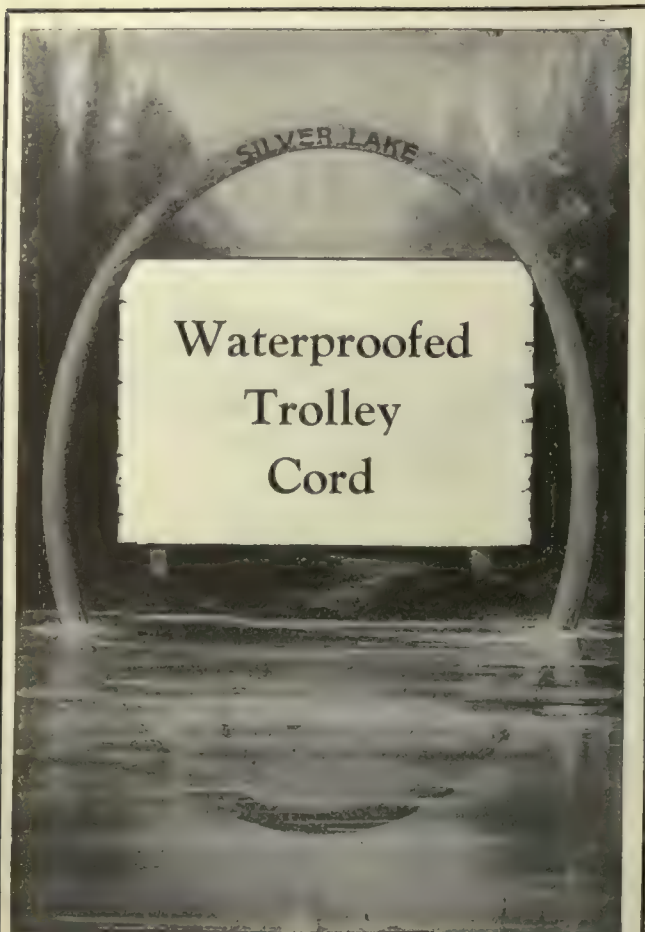
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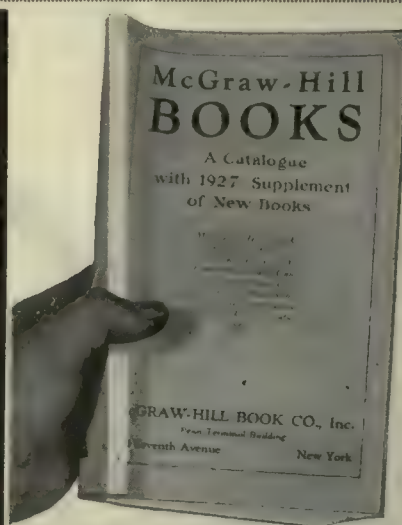
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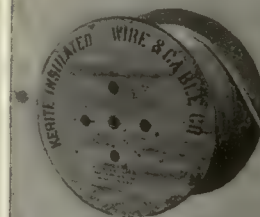
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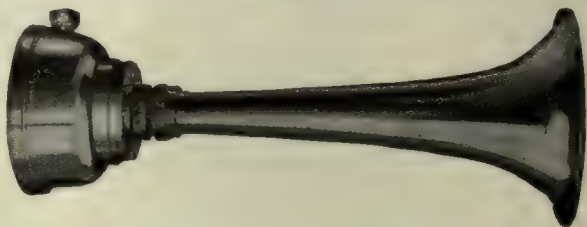
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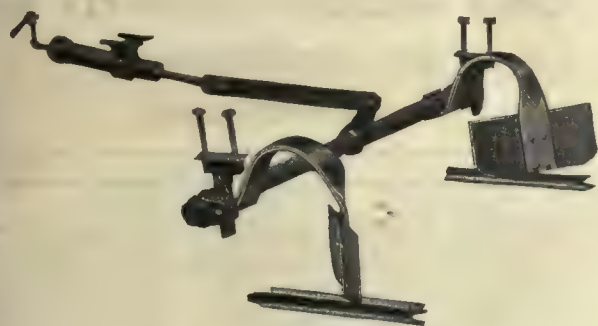
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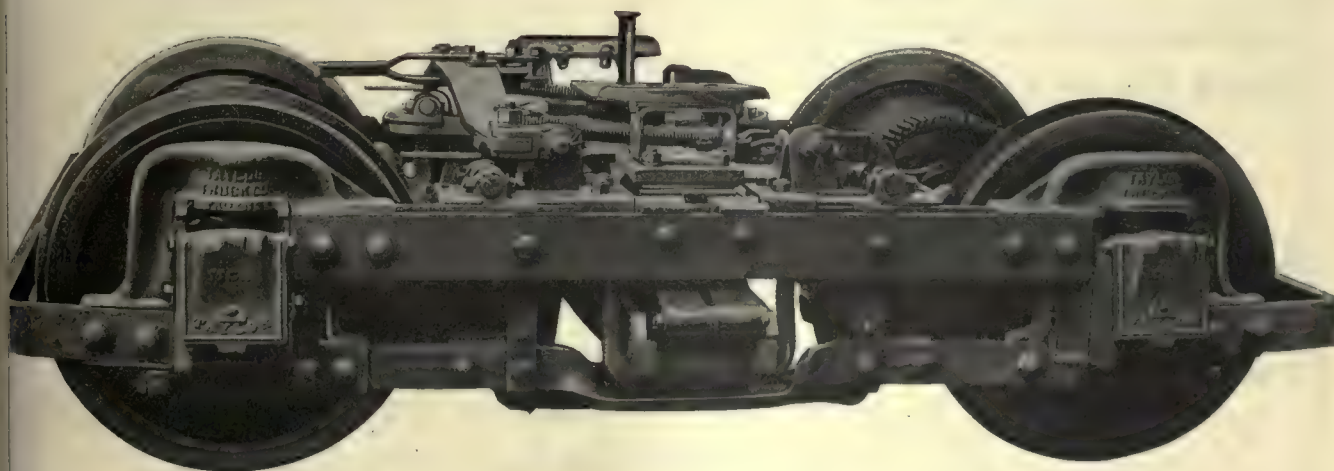
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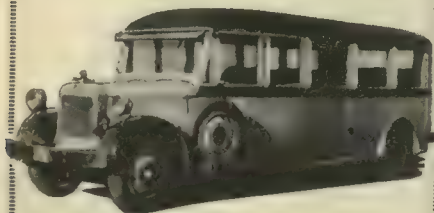
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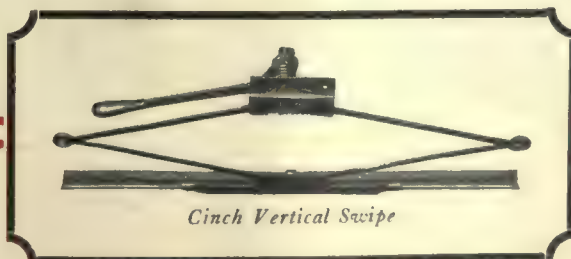
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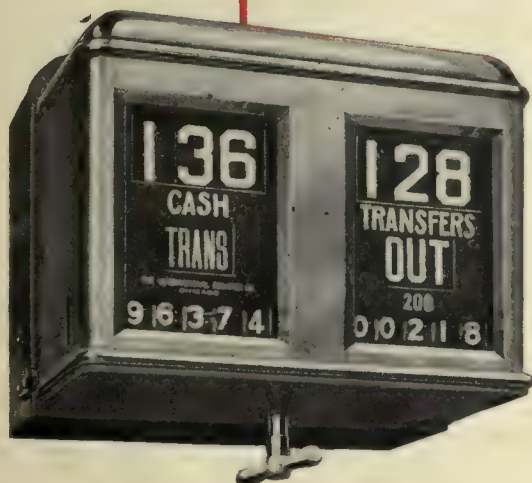
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Hinges
Eberhard Mfg. Co.
- Housts and Lifts**
Columbia Machine Works & M. I. Co.
- Ford Chain Block & M. Co.**
Holists, Portable
Ingersoll-Rand Co.
Sullivan Machinery Co.
- Hose, Bridges**
Ohio Brass Co.
- Hose, Pneumatic**
Westinghouse Traction Brake Co.
- Ignition Units**
Leeco Neville Co.
- Industrial Tractors**
International Harvester Co.
- Inspecting Engineers**
Chemists
Pittsburgh Testing Laboratory
- Instruments, Measuring, Testing and Recording**
American Steel & Wire Co.
Economy Electric Devices Co.
General Electric Co.
National Railway Appliance Co.
Roller-Smith Co.
Westinghouse E. & M. Co.
- Insulating Cloth, Paper and Tape**
General Electric Co.
Irvington Varnish & Ins. Co.
Mica Insulator Co.
Okonite Co.
- Okonite-Callender Cable Co. Inc.**
Westinghouse E. & M. Co.
- Insulating Silk**
Irvington Varnish & Ins. Co.
- Insulating Varnishes**
Irvington Varnish & Ins. Co.
- Insulation (See also Paints)**
Electric Railway Equipment Co.
- Electric Service Sup. Co.**
General Electric Co.
Irvington Varnish & Ins. Co.
Mica Insulator Co.
Okonite Co.
- Okonite-Callender Cable Co. Inc.**
Westinghouse E. & M. Co.
- Insulation, Paper & Roller**
Johns Manville Corp.
- Insulation Slot**
Irvington Varnish & Ins. Co.
- Insulator Pins**
Drew Elec. & Mfg. Co.
- Elec. Service Supplies Co.**
Hubbard & Co.
- Ohio Brass Co.**
Insulators (See also Line Material)
- Drew Elec. & Mfg. Co.**
Electric Railway Equipment Co.
- Elec. Service Supplies Co.**
General Electric Co.
Heminkray Glass Co.
Irvington Varnish & Ins. Co.
Locke Insulator Co.
Ohio Brass Co.
- Westinghouse E. & M. Co.**
Interior Side Linings
Haskelite Mfg. Corp.
- Interurban Cars (See Cars)**
Passenger, Freight Express etc.)
- Iron, Body**
Eberhard Mfg. Co.
- Jacks (See also Cranes, Hoists and Lifts)**
Black Hawk Mfg. Co.
Buda Co.
Columbia Machine Wks.
Elec. Service Supplies Co.
Oil Jack Co.
- Joints, Rail (See Rail Joints)**
Journal Boxes
Bemis Car Truck Co.
Brill Co., The J. G.
Cincinnati Car Co.
St. Louis Car Co.
- Journal Box Liner**
Manganese Steel Forge Co.
- Journal Box & Pedestal Gibs or Liner**
Manganese Steel Forge Co.
- Lacquer**
Arco Co.
- Lamps, Guards and Fixtures**
Elec. Service Sup. Co.
General Electric Co.
Westinghouse E. & M. Co.
- Lamps, Arc and Incandescent (See also Headlights)**
General Electric Co.
Westinghouse E. & M. Co.
- Lamps, Signal and Marker**
Elec. Service Supplies Co.
Nichols-Lintern Co.
Lanterns, Classification
Nichols-Lintern Co.
- Leather**
Cleveland Tanning Co.
- Letter Boards**
Cincinnati Car Co.
- Haskelite Mfg. Corp.**
Lighting Fixtures, Interior
Adams & Westlake
Electric Service Supplies Co.
- Lighting Systems**
Leeco Neville Co.
- Lightning Protection**
Electric Service Sup. Co.
General Electric Co.
Westinghouse E. & M. Co.
- Line Material (See also Brackets, Insulators, Wires, etc.)**
Dossert & Co.
Drew Elec. & Mfg. Co.
- Electric Railway Equipment Co.**
Electric Service Sup. Co.
Eureka Copper Prod. Co.
General Electric Co.
Gilbert & Sons Brass Fdry., A.
- Hubbard & Co.**
Locke Insulator Co.
- National Bearing Metal Corp.**
Ohio Brass Co.
- Westinghouse E. & M. Co.**
Locking Spring Boxes
Wm. Wharton, Jr. & Co. Inc.
- Locomotives, Electric**
Cincinnati Car Co.
Cummings Car & Coach Co.
General Electric Co.
St. Louis Car Co.
- Westinghouse E. & M. Co.**
Locomotives, Oil Engine, Electric Driven
Ingersoll-Rand Co.
- Lubricating Engineers**
Standard Oil Co. (of Ind.)
Texas Co.
- Universal Lubricating Co.**
Lubricants, Oil and Grease
Standard Oil Co. (of Ind.)
Texas Co.
- Universal Lubricating Co.**
Machinery, Insulating
Amer. Insulating Mach. Co.
- Manganese Parts**
Bemis Car Truck Co.
Manganese Steel Forge Co.
- Manganese Steel Castings**
Wm. Wharton, Jr. & Co. Inc.
- Manganese Steel, Special**
Track Work
Bethlehem Steel Co.
Ramapo Ajax Corp.
Wm. Wharton Jr. & Co. Inc.
- Manganese Steel Switches, Frogs and Crossings**
Bethlehem Steel Co.
Ramapo Ajax Corp.
Wm. Wharton, Jr. & Co. Inc.
- Meters (See Instruments)**
Roller-Smith Co.
- Mica**
Mica Insulator Co.
- Mirrors, Inside and Outside**
Cincinnati Car Co.
- Motor Buses (See Buses)**
Motor and Generator Sets
General Electric Co.
- Motor Leads**
Dossert & Co.
- Motors, Electric**
General Electric Co.
Westinghouse E. & M. Co.
- Motorman's Safety Mirrors**
Drew Elec. & Mfg. Co.
- Motorman's Seats**
Brill Co., The J. G.
Cincinnati Car Co.
- Electric Service Sup. Co.**
Hale-Kilburn Co.
Heywood Wakefield Co.
St. Louis Car Co.
Wood Co. Chas. N.
- Nitrocellulose Finishes**
Valentine & Co.
- Nuts and Bolts**
Bemis Car Truck Co.
Bethlehem Steel Co.
Cincinnati Car Co.
Hubbard & Co.
- Ohmmeters**
Roller-Smith Co.
- Oil Purifiers**
De Laval Separator Co.
- Oils (See Lubricants)**
The Standard Oil Co. of Ind.
- Omnibuses (See Buses)**
Ovens
Young Bros.
- Oxy-Acetylene (See Cutting Apparatus Oxy-Acetylene)**
Packing
Westinghouse Traction Brake Co.
- Packing Asbestos**
Johns Manville Corp.
- Paints and Varnishes (Insulating)**
Electric Service Sup. Co.
Irvington Varnish & Ins. Co.
- Mica Insulator Co.**
Paint Guns
Devilbiss Mfg. Co.
- Paint Iron Preservative**
Johns Manville Corp.
- Paint Spray Equipment**
Devilbiss Mfg. Co.
- Paints & Varnishes, Preservative**
Dixon Crucible Co., Joseph
Paints & Varnishes, Railway
National Ry. Appliance Co.
- Paints & Varnishes, Wood-work**
Du Pont De Nemours & Co.
Valentine & Co.
- Paints, Outside, Inside**
Haskelite Mfg. Corp.
- Pavement Breakers**
Ingersoll-Rand Co.
- Sullivan Machinery Co.**
Paving Material
American Brake Shoe & Fdry.
- Pedestal Liner**
Manganese Steel Forge Co.
- Pickups, Trolley Wire**
Drew Elec. & Mfg. Co.
- Electric Service Supplies Co.**
Ohio Brass Co.
- Pinion Pullers**
Drew Elec. & Mfg. Co.
- Elec. Service Supplies Co.**
General Electric Co.
Wood Co., Chas. N.
- Pinions (See Gears)**
Pins & Bushings for Brake Equipment
Manganese Steel Forge Co.
- Pins, Case Hardened, Wood and Iron**
Bemis Car Truck Co.
Ohio Brass Co.
- Westinghouse Tr. Brake Co.**
Pipe Fittings
Standard Steel Works Co.
- Westinghouse Tr. Brake Co.**
Planers (See Machine Tools)
Plates for Tee Rail Switches
Ramapo Ajax Corp.
- Pliers, Rubber Insulated**
Electric Service Sup. Co.
- Plywood, Roofs, Headlining**
Floors, Interior Panels,
Bulkheads, Truss Planks
Haskelite Mfg. Corp.
- Pneumatic Tools**
Ingersoll-Rand Co.
- Pole Clamps**
Clark-Williams Eng. Co.
- Pole Line Hardware**
Bethlehem Steel Co.
- Drew Elec. & Mfg. Co.**
Electric Service Sup. Co.
Ohio Brass Co.
- Poles, Metal Street**
Bates Expanded Steel Truss Co.
- Bates Steel Co., Walter**
Electric Railway Equipment Co.
- Hubbard & Co.**
Truscon Steel Co.
Union Metal Mfg. Co.
- Pole Mountings**
Clark-Williams Eng. Co.
- Pole Reinforcing**
Hubbard & Co.
- Pole Sleeves**
Drew Elec. & Mfg. Co.
- Poles, Ties, Posts, Piling and Lumber**
American Crosscutting Co.
International Crosscutting Co.
- Naigle Pole & Tie Co.**
Poles & Ties Treated
American Crosscutting Co.
International Crosscutting Co.
- Poles, Trolley**
Bell Lumber Co.
Electric Service Sup. Co.
Nuttall Co., R. D.
Truscon Steel Co.
- Poles, Tubular Steel**
Electric Railway Equipment Co.
- Electric Service Sup. Co.**
Truscon Steel Co.
- Portable Grinders**
Buda Co.
- Potholes**
Okonite Co.
- Okonite-Callender Cable Co. Inc.**
Power
Commonwealth Power Co.
- Power Houses**
American Bridge Co.
- Power Saving Devices**
Economy Electric Devices Co.
- National Railway Appliance Co.**
Pressings, Special Steel
Cincinnati Car Co.
- Pressure Regulators**
General Electric Co.
- Westinghouse E. & M. Co.**
Westinghouse Traction Brake Co.
- Pumps**
Ingersoll-Rand Co. (A. S.)
Sullivan Machinery Co.

Modern Transportation Service Demands Modern Revenue Protection



The electrically operated R-10 single register is operated by a specially designed foot control switch mounted on the floor.



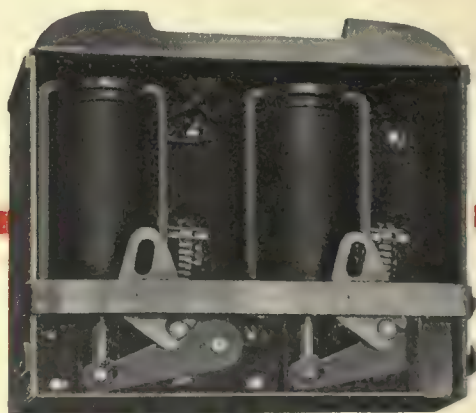
The electrically operated R-11 double register is equipped with two solenoids for the operation of both the cash fare side and the transfer side.

Greater safety for passengers and efficiency in operation is the keynote of modern transportation. In line with this thought is its logical application to the collection and protection of revenue.

International Electrically Operated Fare Registers assure accurate registration of all fares and transfers with the least expenditure of effort on the part of the Car operators. The reliability, speed, and simplicity of electric operation unquestionably makes it the modern way to record fare collections.

International Electrically Operated Fare Registers are relied upon for accuracy by both Conductor and Auditor, as well as with favor by the Public.

These registers are especially adapted for bus use, either mechanical or electrical equipment—hand or foot operated.



The register operating circuit is not broken in the register back. Both solenoids are wound for operation on 350-650 volts, D. C.

SEE OUR
EXHIBIT AT
CLEVELAND
SPACE 128

The International Register Company
15 South Throop St., Chicago

- Pumps, Air Lift**
Sullivan Machinery Co.
- Pumps, Vacuum**
Ingersoll-Rand Co.
Sullivan Machinery Co.
- Punches, Ticket**
International Register Co.
Wood Co. Chas. N.
- Pyroxylin Finishes**
Arco Co.
Du Pont De Nemours Co., E. I.
- Radiators**
Long Mfg. Co.
- Rail Braces and Fastenings**
Ramapo Ajax Corp
- Rail Filler**
Servicised Products Corp.
- Rail Grinders (See Grinders)**
- Rail Joints**
Carnegie Steel Co.
Illinois Steel Co.
Rail Joint Co.
- Rail Joints—Welded**
Lorain Steel Co.
Metal & Thermit Corp.
- Rails, Relaying**
Fort Pitt Spring Co.
- Rails, Steel**
Bethlehem Steel Co.
Carnegie Steel Co.
L. B. Foster Co.
Illinois Steel Co.
- Rail Welding**
Metal & Thermit Corp.
Railway Trackwork Co.
Una Welding & Bonding Co.
- Railway Safety Switches**
Consolidated Car Heating Co.
Westinghouse E. & M. Co.
- Rattan**
Art Rattan Works, Inc.
Brill Co., The J. G.
Cummings Car & Coach Co.
Electric Service Sup. Co.
Hale-Kilburn Co.
St. Louis Car Co.
- Rattan Car Seat Webbing**
Art Rattan Works, Inc.
Heywood Wakefield Co.
- Registers and Fittings**
Brill Co., The J. G.
Cincinnati Car Co.
Electric Service Sup. Co.
International Register Co.
Ohmer Fare Register Co.
St. Louis Car Co.
- Reinforcement, Concrete**
Amer. Steel & Wire Co.
Bethlehem Steel Co.
Carnegie Steel Co.
- Repair Shop Appliances (See also Coil Handling and Winding Machines)**
Elec. Service Supplies Co.
- Repair Work (See also Coils)**
General Electric Co.
Westinghouse E. & M. Co.
- Replacers, Car**
Cincinnati Car Co.
Electric Service Sup. Co.
- Resistances**
Consolidated Car Heating Co.
- Resistance, Wire and Tube**
American Steel & Wire Co.
General Electric Co.
Westinghouse E. & M. Co.
- Retrievers, Trolley (See Catchers and Retrievers, Trolley)**
- Rheostats**
General Electric Co.
Mica Insulator Co.
Westinghouse E. & M. Co.
- Rivet Heaters, Electric**
American Car & Foundry Motors Corp.
- Roller Bearings**
Hyatt Roller Bearing Co.
- Roofing, Asbestos**
Johns Manville Corp.
- Roofing, Car**
Haskelite Mfg. Corp.
Roofing, Shingle Asbestos
Johns Manville Corp.
- Roofs, Car & Bus**
Haskelite Mfg. Corp.
- Safety Control Devices**
Safety Car Devices Co.
- Sanders, Track**
Brill Co., The J. G.
O. M. Edwards Co., Inc.
Electric Service Sup. Co.
Nichols-Lintern Co.
Ohio Brass Co.
St. Louis Car Co.
- Sash Fixtures, Car**
Brill Co., The J. G.
Cincinnati Car Co.
Edwards Co., O. M.
St. Louis Car Co.
- Sash, Metal, Car Window**
Edwards Co., O. M.
Hale-Kilburn Co.
- Scrapers, Track (See Cleaners and Scrapers, Track)**
- Screw Drivers, Rubber Insulated**
Electric Service Sup. Co.
- Seat, Hardware**
Eberhard Mfg. Co.
- Seat Material**
Eberhard Mfg. Co.
- Seating Materials**
Art Rattan Works, Inc.
Brill Co., J. G.
Fitzjohn Mfg. Co.
Hale-Kilburn Co.
Haskelite Mfg. Corp.
- Haywood Wakefield Co.
Massachusetts Mohair Plush Co.
St. Louis Car Co.
- Seats, Bus**
Brill Co., The J. G.
Hale-Kilburn Co.
Heywood Wakefield Co.
Karpen & Bros., S.
St. Louis Car Co.
- Seats, Car (See also Rattan)**
Brill Co., The J. G.
Cincinnati Car Co.
Hale-Kilburn Co.
Heywood Wakefield Co.
Karpen & Bros., S.
St. Louis Car Co.
- Second Hand Equipment**
F. B. Cutter Co.
Grand Rapids Railroad Co.
George Sachsenmair Co.
Hyman-Michaels Co.
H. E. Salzberg Co.
Tacony Housing Assoc.
J. S. Van Loan Corp.
Electric Equipment Co.
- Shades, Vestibule**
Brill Co., The J. G.
Cincinnati Car Co.
- Shock Absorbers**
Cleveland Pneumatic Tool Co.
- Shop Tools**
Black Hawk Mfg. Co.
- Shovels**
Brill Co., The J. G.
Hubbard & Co.
- Shovels, Power**
Brill Co., The J. G.
- Side Bearings (See Bearing—Center and Side)**
- Signals, Car Starting**
Consolidated Car Heating Co.
Electric Service Sup. Co.
National Pneumatic Co., Inc.
- Signals, Indicating**
Nichols-Lintern Co.
- Signal Systems, Block**
Electric Service Sup. Co.
Nachod & U. S. Signal Co.
Union Switch & Signal Co.
Wood Co., Chas. N.
- Signal Systems, Highway Crossing**
Nachod & U. S. Signal Co.
- Signals, Warning**
American Strombos Co.
- Slack Adjusters (See Brake Adjusters)**
- Slag**
Carnegie Steel Co.
- Sleet Wheels and Cutters**
Anderson Mfg. Co., A. & J. M.
Cincinnati Car Co.
Columbia Machine Works & M. I. Co.
- Electric Railway Equipment**
Co.
- Electric Railway Improvement Co.**
- Electric Service Supplies Co.**
- Eureka Copper Products Co.**
- National Bearing Metal Corp.**
- Nuttall Co., E. D.**
- Smokestacks, Car**
Nichols-Lintern Co.
- Snow Plows**
National Railway Appli-
cance Co.
- Snow-Plows, Sweepers and Brooms**
Brill Co., The J. G.
Columbia Machine Works & M. I. Co.
Consolidated Car Fender Co.
Cummings Car & Coach Co.
Root Spring Scraper Co.
St. Louis Car Co.
- Snow Sweeper, Rattan**
J. G. Brill Co.
Heywood Wakefield Co.
- Solder**
A. Gilbert & Son Brass Fdry. Co.
- Soldering and Brazing Apparatus (See Welding Processes and Apparatus)**
- Special Adhesive Papers**
Irvington Varnish & Ins. Co.
- Special Trackwork**
Bethlehem Steel Co.
Lorain Steel Co.
Wm. Wharton, Jr. & Co. Inc.
- Spikes**
Amer. Steel & Wire Co.
Illinois Steel Co.
Splicing Compounds
Westinghouse E. & M. Co.
Splicing Sleeves (See Clamps and Connectors)
Spray Nozzles
Drew Elec. & Mfg. Co.
- Springs**
Fort Pitt Spring & Mfg. Co.
National Railway Appli-
cance Co.
- Springs, Car and Truck**
American Spiral Spring Co.
American Steel Foundries
Amer. Steel & Wire Co.
Bemis Car Truck Co.
Brill Co., The J. G.
Cincinnati Car Co.
- Fort Pitt Spring & Mfg. Co.
Mather Spring Co.
St. Louis Car Co.
Standard Steel Works Co.
Taylor Electric Truck Co.
- Sprinklers, Track and Road**
Brill Co., The J. G.
Cummings Car & Coach Co.
St. Louis Car Co.
- Stair Steps, Safety**
Irving Iron Works
- Steel and Steel Products**
American Steel & Wire Co.
Carnegie Steel Co.
Illinois Steel Co.
- Steps, Car**
Brill Co., The J. G.
Cincinnati Car Co.
Irving Iron Works
- Steps, Folding**
Eberhard Mfg. Co.
- Stokers, Mechanical**
Babcock & Wilcox Co.
- Westinghouse E. & M. Co.**
- Stop Signals**
Nichols-Lintern Co.
- Storage Batteries (See Bat-
teries, Storage)**
- Strain, Insulators**
Anderson Mfg. Co., A. & J. M.
- Electric Service Supplies Co.**
- Ohio Brass Co.**
- Westinghouse E. & M. Co.**
- Strand**
American Steel & Wire Co.
- Roebbling's Sons Co., J. A.**
- Straps, Hand**
Central Equipment Co.
- Street Cars (See Cars, Pas-
senger, Freight, Express
etc.)**
- Superheaters**
Babcock & Wilcox Co.
- Sweepers, Snow (See Snow-
Plows, Sweepers and
Brooms)**
- Switch Stands and Fixtures**
Ramapo Ajax Corp.
- Switchboards, Asbestos**
Johns Manville Corp.
- Switches**
Eureka Copper Products Co.
- Switches, Selector**
Nichols-Lintern Co.
- Switches and Switchboards**
Consolidated Car Heating Co.
- Electric Service Sup. Co.**
- General Electric Co.**
- Westinghouse E. & M. Co.**
- Switches, Tee Rail**
Ramapo Ajax Corp.
- Switches, Track (See Trac-
ing Special Work)**
- Synchroscopes**
Roller-Smith Co.
- Tampers, Trolley**
Ingersoll-Rand Co.
- Railway Trackwork Co.**
- Tapes and Cloths (See Insu-
lating Cloth, Paper and
Tape)**
- Tee Rail Special Track Work**
Bethlehem Steel Co.
Ramapo Ajax Corp.
Wm. Wharton, Jr. & Co. Inc.
- Telephones and Parts**
Electric Service Sup. Co.
- Telephone & Telegraph Wire**
American Steel & Wire Co.
- Testing Instruments (See In-
struments, Electrical Measur-
ing, Testing, etc.)**
- Thermistats**
Consolidated Car Heating Co.
Gold Car Heating & Light-
ing Co.
Railway Utility Co.
Smith Heater Co., Peter
- Ticket Choppers & Destroyers**
Electric Service Sup. Co.
- Tickets & Transfers**
Globe Ticket Co.
- Ties, Mechanical**
Davton Mechanical Tie Co.
- Ill Plates**
Illinois Steel Co.
- Ties and Tie Rods, Steel**
American Bridge Co.
Carnegie Steel Co.
International Steel Tie Co.
- Ties, Wood Cross (See Pole-
Ties, Posts, etc.)**
- Tires**
Fisk Tire Co.
General Tire and Rubber Co.
Goodrich Tire Co.
Goodyear Tire & Rubber Co.
Kelly Springfield Tire Co.
Miller Rubber Co.
- Tokens**
Johnson Fare Box Co.
- Pongue Switches**
Wm. Wharton, Jr. & Co. Inc.
- Tool Steel**
Bethlehem Steel Co.
Carnegie Steel Co.
- Tools, Track & Miscellaneous**
Amer. Steel & Wire Co.
Columbia Machine Works & M. I. Co.
Electric Service Sup. Co.
Hubbard & Co.
Railway Trackwork Co.
- Torches, Acetylene (See Cut-
ting Apparatus)**
- Towers and Transmissions**
Structures
- Archbold-Brady Co.**
- Bates Expanded Steel Truss Co.**
- Bates Steel Corp.**
- Westinghouse E. & M. Co.**
- Tower Wagons and Auto Trucks**
MacCardell & Co., J. R.
- Track Expansion Joints**
Wm. Wharton, Jr. & Co. Inc.
- Track Grinders**
Metal & Thermit Corp.
Railway Trackwork Co.
- Ramapo Ajax Corp.**
- Una Welding & Bonding Co.**
- Track, Special Work**
Bethlehem Steel Co.
Columbia Machine Works & M. I. Co.
- Ramapo Ajax Corp.**
- Wm. Wharton, Jr. & Co. Inc.**
- Trackless Trolley Cars**
Brill Co., The J. G.
St. Louis Car Co.
- Transfer Issuing Machines**
Ohmer Fare Register Co.
- Transfer Tables**
American Bridge Co.
- Transfers (See Tickets)**
- Transformers**
General Electric Co.
Westinghouse E. & M. Co.
- Transmission Towers & Structures**
American Bridge Co.
- Traps, Steam & Radiator**
Control Valves, Radiator
Johns Manville Corp.
- Treads Safety Stair Car Step**
Cincinnati Car Co.
Irving Iron Works
- Tree, Wire**
Okonite Co.
Okonite-Callender Cable Co.
- Trolley Bases**
General Electric Co.
National Bearing Metal Corp.
- Nuttall Co., E. D.**
- Ohio Brass Co.**
- Trolley Bases, Retrieving**
General Electric Co.
- Nuttall Co., E. D.**
- Ohio Brass Co.**
- Trolley Buses**
Brill Co., The J. G.
General Electric Co.
Westinghouse E. & M. Co.
- Trolley Materials**
Anderson Mfg. Co., A. & J. M.
- Drew Elec. & Mfg. Co.**
- Trolley Material (Overhead)**
Electric Service Sup. Co.
- National Bearing Metal Corp.**
- Ohio Brass Co.**
- Westinghouse E. & M. Co.**
- Trolley Switches**
Railway Materials Corp.
- Trolley Wheel Bushings**
National Bearing Metal Corp.
- Star Brass Works**
- Trolley Wheels (See Wheels, Trolley)**
- Trolley Wire**
American Brass Co.
Amer. Electrical Works
American Steel Foundries
Amer. Steel & Wire Co.
Anaconda Copper Min. Co.
Bridgeport Brass Co.
Roebbling's Sons Co., J. A.
- Trolleys and Trolley Systems**
Ford Chain Block & M. Co.
- Truck & Body Bolster Center Plates**
Manganese Steel Forge Co.
- Trucks, Car**
Bemis Car Truck Co.
Brill Co., The J. G.
Cincinnati Car Co.
Cummings Car & Coach Co.
St. Louis Car Co.
Taylor Electric Truck Co.
- Trucks, Motor**
International Harvester Co.
Waukesha Motor Co.
White Motor Co.
- Truss Planks**
Haskelite Mfg. Corp.
- Tubing, Yellow and Black**
Flexible Varnish
Irvington Varnish & Ins. Co.
- Turbines, Steam**
General Electric Co.
- Westinghouse E. & M. Co.**
- Turnstiles**
Electric Service Sup. Co.
- Percy Mfg. Co., Inc.**
- Turntables**
American Bridge Co.
Electric Service Supplies Co.
- Vacuum Cleaners**
Invincible Vacuum Cleaner Co.
- Valves**
Ohio Brass Co.
Westinghouse Tr. Br. Co.
- Varnished Papers and Silks
Irvington Varnish & Ins. Co.
- Ventilators**
National Ry. Appliance Co.
- Ventilators, Car**
Brill Co., The J. G.
Cincinnati Car Co.
Consolidated Car Heating Co.
Nichols-Lintern Co.
Railway Utility Co.
St. Louis Car Co.
- Vestibule Linings**
Haskelite Mfg. Corp.
- Voltmeters**
Roller-Smith Co.
- Waterproofing**
Johns Manville Corp.
- Welded Rail Joints**
Electric Railway Improve-
ment Co.
- Lorain Steel Co., The**
- Metal & Thermit Corp.**
- Railway Trackwork Co.**
- Una Welding & Bonding Co.**
- Westinghouse E. & M. Co.**
- Welders, Rail Joint**
Ohio Brass Co.
- Railway Trackwork Co.**
- Welding Processes and Apparatus**
Electric Railway Improve-
ment Co.
- General Electric Co.**
- Metal & Thermit Corp.**
- Ohio Brass Co.**
- Railway Trackwork Co.**
- Una Welding & Bonding Co.**
- Westinghouse E. & M. Co.**
- Welding Steel**
Electric Railway Improve-
ment Co.
- Railway Trackwork Co.**
- Una Welding & Bonding Co.**
- Welding Wire**
American Steel & Wire Co.
General Electric Co.
- Railway Trackwork Co.**
- Roebbling's Sons Co., J. A.**
- Welding Wire and Rods**
Railway Trackwork Co.
- Wheel Guards (See Fender-
and Wheel Guards)**
- Wheel Presses (See Machin-
ery Tools)**
- Wheels, Car, Cast Iron**
Association of Mfrs. of
Chilled Car Wheels
Griffin Wheel Co.
- Wheels, Car Steel & Steel Tire**
American Steel Foundries
Bemis Car Truck Co.
Carnegie Steel Co.
Illinois Steel Co.
Standard Steel Works Co.
- Wheels, Motor**
Motor Wheel Corp.
- Wheels, Steel**
Clark Equipment Co.
Dayton Steel Foundries
- Wheels, Steel Disc**
Budd Wheel Co.
- Wheels, Trolley**
Columbia Machine Works & M. I. Co.
- Electric Railway Equipment Co.**
- Electric Service Supplies Co.**
- Eureka Copper Prod. Co.**
- General Electric Co.**
- Gilbert & Sons Brass Fdry., A.**
- National Bearing Metal Corp.**
- Nuttall Co., E. D.**
- Star Brass Works**
- Wheels, Wrought Steel**
Carnegie Steel Co.
Illinois Steel Co.
- Whistles, Air**
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Ohio Brass Co.
Westinghouse E. & M. Co.
- Westinghouse Traction Brake Co.**
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American Creosoting Co.



Cincinnati's Reconstruction Program

Cincinnati is in the midst of an extensive track reconstruction program. During 1926, eleven miles of track were built. For 1927 the program calls for rebuilding at least 27 miles of single track, and by 1930 a considerable part of the total trackage will be reconstructed.

On Madison Road, pictured above, 8300 feet of track were built, using the old foundation which was in excellent condition. Carnegie M-25 Steel Cross Ties were used on the outbound track, spaced 3 ft. center to center, and mounted on a 1:3:6 concrete foundation 6 in. thick below the base of the tie. On the inbound track a lighter Carnegie Tie was used, spaced 2 ft. apart, in the old wood tie pockets.

Carnegie Steel Cross Ties are giving satisfactory service in hundreds of installations. Traction companies are finding that it pays to build permanently—with Steel.

Booklet—"Steel Cross Ties"—on request.

1875

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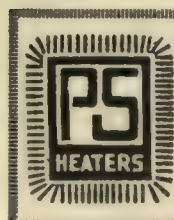
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PENNSYLVANIA

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—are no longer operating problems. We can show you how to take care of both with one equipment. The Peter Smith Forced Ventilation Hot Air Heater will save, in addition, 40% to 60% of the cost of any other car heating and ventilating system. Write for details.

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Standard
Freight
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Motor Freight Car

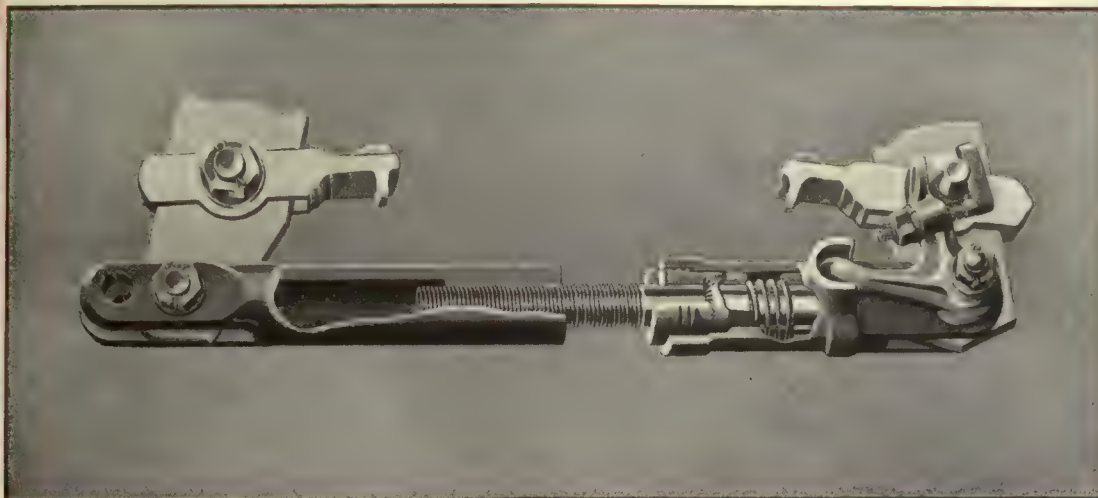
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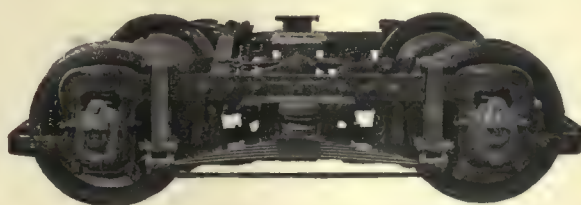
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A mechanical slack adjuster, which while comparatively new has been thoroughly tested and proven its merit in the automatic adjustment of brakes during the life of the

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To be exhibited in Space No. 120



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Rockford wanted Modern Cars and specified **Brill Seats**

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Watch this space in next issue.



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ELECTRIC RAILWAY JOURNAL

Hill Publishing Company, Inc.

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Turning Point

in street car service

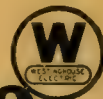
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No. 13

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A Better Daily at Cleveland

FOR many years ELECTRIC RAILWAY JOURNAL has published a daily edition in connection with the annual convention of the American Electric Railway Association. This is its service to the delegates at the convention. One of its functions is to point out and to interpret the exhibits of new cars, new track, new buses and new devices. The DAILY JOURNAL is ever new.

This year it is planned to expand and improve the service given by the daily issued during the Cleveland convention in keeping with the spirit of the industry. There will be four issues instead of three, the first one appearing on Monday morning when the delegates are most in need of information regarding the exhibits, details of the program, and announcements of important events. Then, too, the DAILY will be so arranged that it will be even more readable than it has been in the past. Instead of going into detail here, we will only say, "Watch for the DAILY."

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(Published in San Francisco)

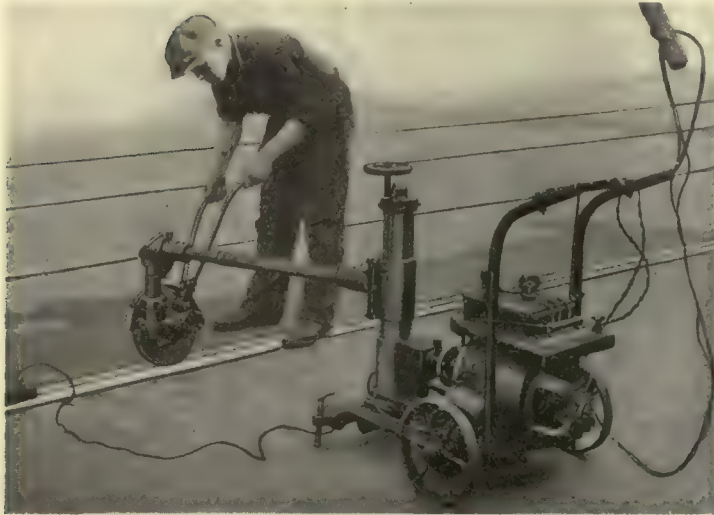
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(Published in London)



FOR BETTER TRANSPORTATION

Here's the newest aid to track betterment



Flexible manipulation of grinding wheel is made easy.



Grinding wheel arm swings aside to pass cars without removing trolley pole.

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A small, light, portable grinder for use where flexible manipulation of the grinding wheel is desirable. Fine for grinding Thermit joints before finishing with the "Vulcan" which then makes a perfectly smooth joint.

Eureka is also suitable for grinding off surplus weld metal under heavy traffic conditions. Swivel joints permit tilting the grinding wheel at any angle, at the same time allowing grinding wheel to travel in a straight line. A small hand wheel

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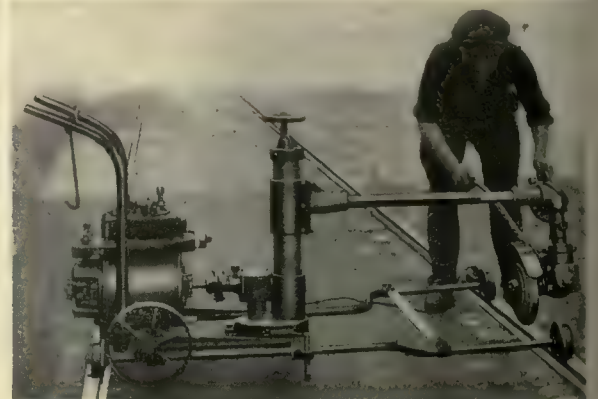
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Titon Bond

Large contact area of terminals, and extreme flexibility of this type afford an exceptionally durable bond, practically immune to vibration. Adapted to standard T-rail joints. Cat. No. 14841.



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Large terminals, which open on the side facing the rail, make it easy for the welding crew to install O-B Bonds quickly and properly. Terminals, cable strands and rail are united each to the other in a solid homogenous weld, having permanently low resistance. Long life in service is assured because copper sleeves between cable strands and terminals protect the strands against vibration. This avoids loss of current and high resistance due to worn, loose or improperly applied bonds—makes a highly efficient return circuit certain.

And there's a direct saving in power costs with an O-B Bonded return circuit. Faster schedules are possible due to more uniform and higher trolley voltage. Full working voltage is supplied to the motors—current formerly wasted is used for more efficient operation.

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Made practical in the Davis "One-Wear" Steel Wheel by the use of special heat-treated wheel metal.

Ordinary steel makes an ordinary wheel. Only its special composition makes the Davis Steel Wheel "One-Wear" in performance as well as in name.

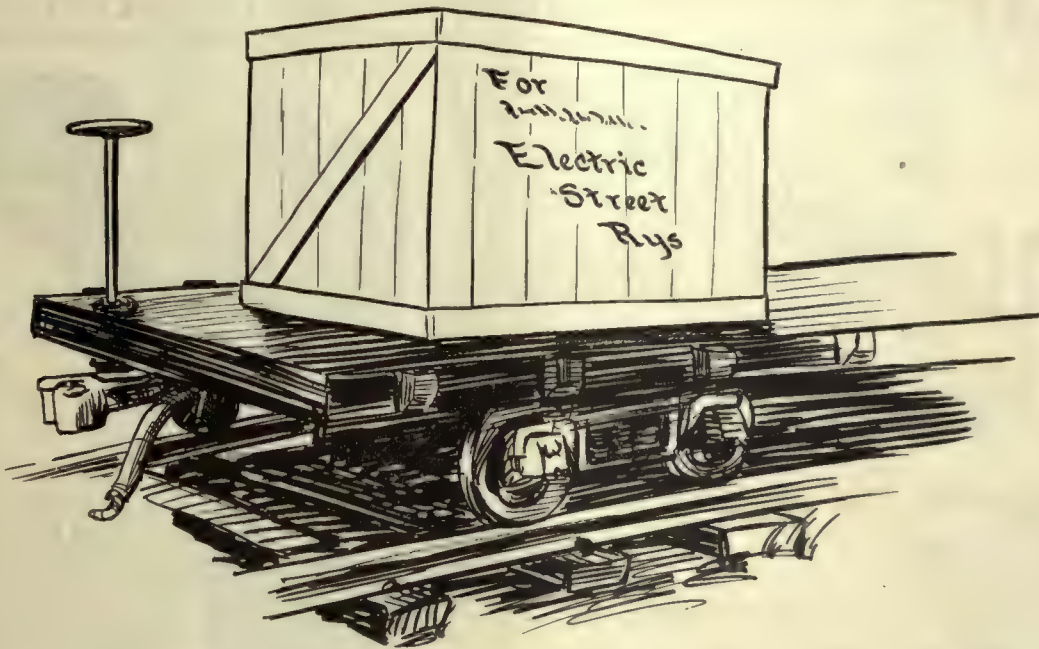


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NEW YORK

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ST. LOUIS



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It does with *one* man a job that formerly took *four*—and it does it quicker and more accurately.

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May we talk paved track *costs* with you?
Our data is very complete.

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CLEVELAND, OHIO

Look it up in your "Paved Track Note Book"

Steel Twin Tie Track

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"QUALITY MACHINES FOR QUALITY SERVICE"

The Westinghouse National

"A complete line of compressors"

WESTINGHOUSE-NATIONAL air compressors are made in a great variety of types and sizes to suit the requirements of every class of service—in factories, office buildings, newspaper plants, railway terminals, garages, quarries, mines, general construction work—or wherever a dependable supply of compressed air is required.

A degree of mechanical perfection that gives them a well-earned reputation for long life, dependability, and operating economy, is embodied in all compressors of the Westinghouse-National "family"—which includes steam, belt, and motor driven types, in sizes ranging from 3 to 700 cu. ft. displacement. The illustrations show several of these different types.

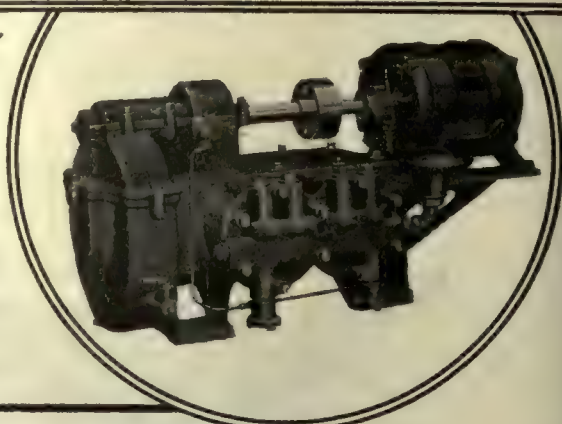
Write for descriptive literature, or ask to have our representative call to consider your compressor needs and recommend the particular type suited to the purpose.

Westinghouse Traction Brake Co.

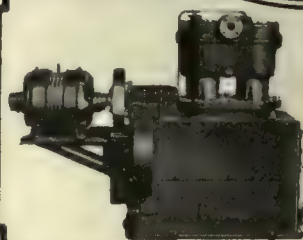
Industrial Division

General Offices and Works: Wilmerding, Pa.

N Type Compressor—12 to 60 cu. ft. displacement. Described in Publication T-2048.



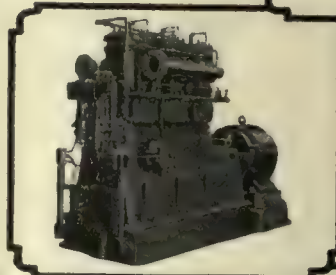
2V Type Compressor—75 to 150 cu. ft. displacement. Described in Publication T-2047.



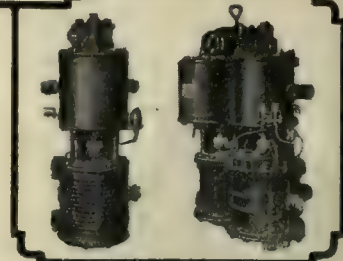
3VS Type Compressor—208 to 468 cu. ft. displacement. Described in Publication T-2032.



3VD Type Compressor—550 to 700 cu. ft. displacement. Described in Publication T-2032.



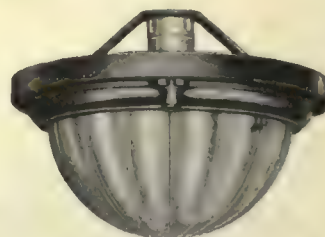
Steam Driven Types—35 to 150 cu. ft. displacement. Described in Publications T-2036 and T-2037.



WESTINGHOUSE-NATIONAL Air Compressors



Dome Type Lighting Fixtures *make cars attractive*



It's a noticeable fact that the public, whenever possible, selects a conveyance that not merely gets them somewhere, but one that is attractive as well.

Dome Type Lighting Fixtures are designed to provide this essential attractiveness — to give a luxurious Pullman effect.

These fixtures have beautiful Druid glass bowls which produce a soft, pleasing well-diffused light. Substantially made to withstand extreme vibration. Ask for new and interesting wiring plans.

ELECTRIC SERVICE SUPPLIES COMPANY

PHILADELPHIA, 17th and Cambria Sts.; NEW YORK, 50 Church St.; CHICAGO, Ill. Merchants Bank Bldg., Pittsburgh, Bessemer Bldg.; Boston, 88 Broad St.; Detroit, General Motors Bldg.; Scranton, 316 N. Washington Ave.; Canadian Agents, Lyman Tube & Supply Company, Ltd., Montreal, Toronto, Vancouver.

ELECTRIC SERVICE SUPPLIES Co.

MANUFACTURER OF RAILWAY POWER

AND INDUSTRIAL ELECTRICAL MATERIAL



FOR EVERY TYPE OF CAR IN EVERY TYPE OF SERVICE—

“Standard” materials are helping to
maintain efficient transportation

STEEL WHEELS
AXLES



SPRINGS
ARMATURE SHAFTS

VISIT SPACE 267 AT CLEVELAND



STANDARD STEEL WORKS COMPANY

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When You Plan A Modern Car

plan to interchange your passengers by means of "circulating load." The NP Automatic Treadle Exit Door has made this practical in either one or two-man service, irrespective of the size or type of car.



KEEP THIS IN MIND

NATIONAL PNEUMATIC COMPANY

Executive Office, Graybar Building, New York

General Works, Rahway, New Jersey

CHICAGO
518 McCormick Building

MANUFACTURED IN TORONTO, CANADA, BY
Railway & Power Engineering Corp., Ltd.

PHILADELPHIA
1010 Colonial Trust Building

A

\$25,000 sale 15 *minutes* after deciding to call



"THIS METHOD OF SECURING the sale," writes the treasurer of the company, "represented several hundred dollars additional profit to us."

Such is the every-day work of Long Distance for men who are busy. The long lines reach from each office to any other, from Canada to Cuba to England. The continent or any chosen area is the field of action for the man who travels by telephone. Long distance calls accomplish in minutes what otherwise

THE OFFICIALS of a metal specialties company in Plano, Illinois, were discussing an interview that should be made at once in New York. Prospects were fair for making the sale. But the men were unusually busy . . . how could they spare the time to go and return? They decided to telephone. Within 15 minutes the sale was consummated. The amount involved was \$25,000.

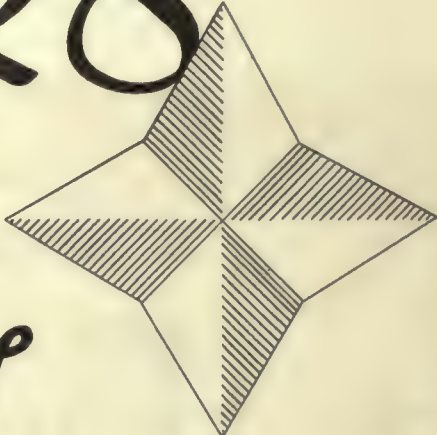
might take weeks or days. They result in growth to the individual and to the business. They slash expense. They mean efficiency with comfort.

What far-away transactions could you close now — without leaving the office? You'll be surprised how little the calls will cost. . . . *Number, please?*

BELL LONG DISTANCE SERVICE



CINCINNATI BUILDS *for 1928*



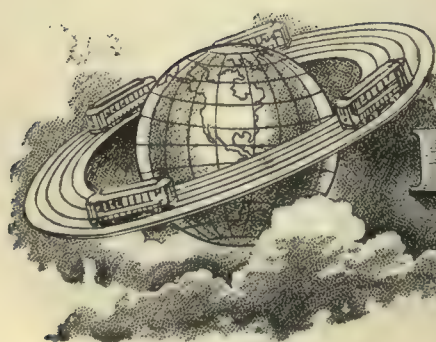
*The Four Features
of Balanced Design
are the Cardinal Points
of Today's demand.*

You'll agree when you
see our exhibit at the
Convention—

Track D

CINCINNATI BALANCED
LIGHTWEIGHT CARS
— still a step ahead of the modern trend!

JUST as the electric railway companies have to compile and be guided by exhaustive statistics as to peak loads, traffic densities, costs per mile, and so forth, we must constantly keep ourselves informed as to purchasing power, density of population and all vital market information in order to maintain our service as an active asset of your service.



Barron G. Collier

INCORPORATED

CANDLER BLDG. NEW YORK



Increased Plant Facilities—Tangible Evidence of the “Spirit of St. Louis”

St. Louis has confidence in the future of the transportation business. With the acceptance of the Spirit of St. Louis by steam railroads as well as by electric railways, greater demands have been made on the Quality Shops. Greater manufacturing facilities have become necessary.

The new modern steel fabricating and erection Shop, the largest of its kind devoted to the building of cars, is 1,000 feet long and 135 feet wide. Equipped with ma-

chines and tools for each process in the fabrication of quality car equipment, St. Louis offers every facility in executing careful and efficient car building in accordance with your specifications.

You are cordially invited to visit the Quality Shops, inspect the work in progress and ascertain first hand our ability to serve.

St. Louis Car Co.





On the shores of the Atlantic



Through Busy Cities

YELLOW COACHES

from coast to coast Yellow Coaches, by dependable, economical operation, are placing motor coach transportation on a sound basis where performance is unquestioned . . .



Along Inland Highways



In sight of the Pacific

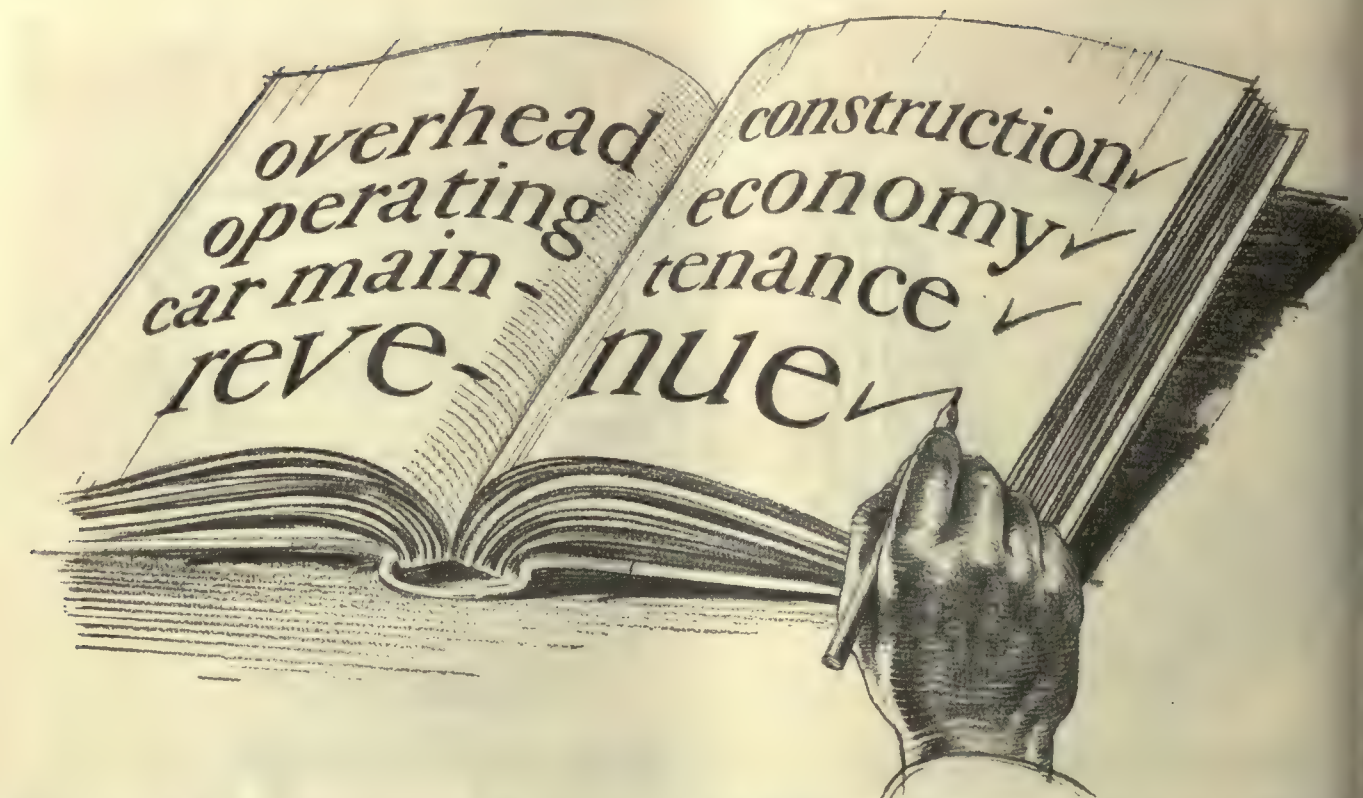
build REVENUE

Year after year, more street railway companies
buy Yellow Coaches than any other make - -
More Yellow Coaches are bought by street
railway companies than any other make.

YELLOW COACH

• a General Motors Product





For all-round health of operation

The railway executive cannot afford to give exclusive attention to any one department. He does not follow overhead to the neglect of maintenance, or operating economy without regard to revenue. He works with a more comprehensive vision and so obtains all-round health of operation.

The manufacturer of railway equipment and renewal parts is under a like obligation. He cannot afford to devote his energies to coils alone—he must also be thoroughly familiar with the motors which they serve. He dare not give sole attention to certain items to the neglect of others.

General Electric realizes its responsibilities for the assembly as a whole—not merely for coils or gear cases or other separate parts. In the entire list of G-E supplies and renewal parts there is not one experimental oddity; every single item is in complete accord with the whole assembly—and is of original-equipment quality.



GENERAL ELECTRIC

GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y., SALES OFFICES IN PRINCIPAL CITIES

Electric Railway Journal

Consolidation of Street Railway Journal and Electric Railway Review

Published by McGraw-Hill Publishing Company, Inc.

CHARLES GORDON, Editor

Volume 70

New York, Saturday, September 24, 1927

Number 13

"Liberty" Wants a Statesman

ONCE more the street car is put on the defensive. Once more it is labeled "archaic." Even the editor of a high-pressure magazine like *Liberty* falls into the rut of opinion expressed by those who know little about the facts of traffic and local transportation. While calling upon the motor car manufacturers to produce a "Statesman of Transportation," in an editorial published in its issue of Sept. 17, 1927, *Liberty* summarizes the situation as follows:

Numerous solutions of the problem [traffic congestion] have been offered, of course, but no one of them will do the job. Street cars are on their way out as archaic. Buses, taxis and subways give congested populations greater mobility. Chicago was the first to try double-deck streets. Other cities will follow. Two-level streets speed up traffic movement. In spite of these makeshifts, people get in one another's way and automobile jams are growing worse.

The automotive industry has the most at stake in this situation.

Here are a number of statements which are of great interest to the local transportation industry. Taking the last one first, *Liberty* apparently starts with the wrong premise. The automotive industry has a lot at stake, to be sure. So also has the \$6,000,000,000 electric railway industry. *Liberty* joins with Walter P. Chrysler and L. F. Loree in the superficial conclusion that the street car is on its way to the scrap heap. If these gentlemen are really interested in the status and future of street cars a trip to Cleveland during the week of Oct. 2 would help considerably to clarify their thinking.

It is not the automotive industry that has the most at stake in the traffic situation. It is the community itself which is losing the most and which will be called upon to foot the bill for whatever relief plans are undertaken. "Two-level streets speed up traffic movement," says *Liberty*. But who is going to pay for them? The automobile manufacturers? Certainly not! They didn't pay for the two-level street in Chicago, and their primary objective in producing a "statesman of transportation" would be to make sure they don't pay for them anywhere else. Of course, there isn't anything wrong with that. The responsibility of providing adequate thoroughfares for the movement of people in cities belongs to the community and to the property owners, the latter because greater accessibility increases the value of their holdings. Even *Liberty* will probably agree that the community should and probably will pay the bill for facilities to reduce traffic congestion. It seems reasonable to assume so that the primary purpose of traffic relief is to permit people to move about in cities with greater speed, comfort and convenience. If that premise is granted, where does it lead? Certainly, our premise precludes the conclusion that traffic relief should be undertaken from the point of view of increasing the market for more automobiles.

It is at least interesting to pursue this reasoning just one step further. In the Sept. 17, 1927, Annual Convention Number of the JOURNAL, on page 485, E. J. McIlraith, staff engineer of the Chicago Surface Lines, expressed in rather vivid language some figures on relief

of traffic congestion that are the outcome of several years of careful study and analysis. He says that one four-track electric line on specialized right-of-way can serve more people in the rush hour than 25 boulevards used by private vehicles alone. Certainly that is of some importance to the community which undertakes to meet the bill for traffic relief!

Liberty calls on the motor car manufacturers to take the lead and promises that the 20,000,000 car owners will gladly follow. What about the 16,000,000,000 passengers who annually depend for transportation on the electric railway lines of the country? Are they not entitled to consideration in approaching the problem of traffic relief? The country needs a statesman of transportation. But it won't get what it needs if he represents the very manufacturers whose product has caused our present congestion.

Onus for Delay in St. Louis on City

HOPE has been renewed that something tangible may come out of the moves now being made in St. Louis in connection with the affairs of the United Railways. These moves have to do with an appeal to the Public Service Commission for the approval of the securities intended to be issued under the terms of the reorganization plan and with the granting of a new franchise to the St. Louis Public Service Corporation, the proposed successor to the United Railways.

Many things have militated against the lifting of the receivership, not the least significant of which has been the attitude of the city toward the franchise and the financial affairs of the company. Some things, however, appear to be clearly defined. While Mayor Miller has outlined four tentative modes of procedure, one of which contemplates municipal ownership, he is set against this procedure. In this, of course, he is wise. He apparently is reconciled to a service-at-cost proposal, but has split with the company over the allowed rate of return. In addition he has not seen his way clear to accept the value of \$60,000,000 which the reorganization committee made plain it was willing to have fixed for its property. This appears to have been a real concession, for the general belief is that the commission, if the company insists upon it, must fix a value for the property much in excess of this amount.

Meanwhile the city talks through the Mayor about the need of it having expert advice. Such advice it has had in the past and is entitled to in the future. Only recently one of the country's most prominent utility experts has reported to the Mayor findings not yet made public in full, but said to contain recommendations for co-ordination, with operation on a service-at-cost basis. St. Louis is entitled to all the advice it can get, but it does seem that the city has not availed itself fully of recommendations that have been made in the past. That is unfortunate.

Not all the moves made in a receivership that has

existed since 1919 can even be indicated in comment of this kind, but one thing is certain, the disposition on the part of the representatives of the security holders has not been to prolong the receivership. In fact, the decks were cleared for financial action about three years ago. The city should develop a policy and proceed to the work of negotiating with determination; determination that will take fully into account the rights of the company and the city's future needs so far as it is possible to prognosticate them. Let it not seek the unattainable. As Federal Judge Faris pointed out in approving the sale of the St. Louis properties at foreclosure, any suggestion of a return to the 5-cent fare is not even respectable nonsense, pointing out that while fares have advanced from 5 to $7\frac{1}{2}$ and 8 cents, the expenditure for wages, equipment and materials by the company in the same period have advanced 81 per cent. This seems generally to be realized in city circles. So with the need recognized that the company must have a living wage, it ought not to be difficult, if the city approaches the matter in the right spirit, to adjust satisfactorily the matters that have up to this time militated against the settlement. The onus for the delay appears to be clearly upon the city.

The Wording of an Ordinance Penalizing Transfer Abuse Is Important

EVEN in doing a meritorious act there is always a right way and wrong way. The city of St. Louis found this out recently when an effort was made to enforce one of its ordinances punishing abuses of street railway transfers. The ordinance declared it to be unlawful to sell, barter or exchange for any consideration a street railway transfer, or even to give it away to enable another person to use it, or for any person to whom such a transfer was not issued to attempt to use it, or for him to punch or alter the punching of such a transfer, or to attempt to make a round trip by use of a railway transfer. Agents and employees of the railway company issuing transfers to passengers lawfully entitled to them were excepted.

The purpose of the law was entirely meritorious. In a prosecution under it, however, the Supreme Court of Missouri in a decision rendered June 27, 1927, held that the ordinance prescribed the use that might be made of transfer tickets and thereby invaded the province of the Public Service Commission. If, for example, the commission should make these tickets transferable, the ordinance would then be in conflict with the commission's ruling. The fact that the ordinance prescribed a course which coincided with the rulings of the commission did not help the situation because "the city of St. Louis was without the power to regulate to any extent, directly or indirectly, the rates of a public utility, or to prescribe regulations or practices which affect such rates."

While the court thus condemned the wrong way of stopping transfer abuses, it also pointed out the right way. This, it said, was to require under penalty that the individuals composing the public in their dealings with the utility shall observe its rules and regulations, as these rules presumably have had the approval of the Public Service Commission. An ordinance of this kind would avoid any invalidity on the ground that the city was exercising, or attempting to exercise, a control over rates and charges.

It may be assumed that with this legal background the city will amend the ordinance accordingly.

Two Track Reports of Unusual Interest

IN THE American Electric Railway Engineering Association this year two committees in the way and structures division have been working on subject assignments in which way departments throughout the industry are vitally interested. One of these committees is investigating the use of alloys other than manganese steel for special trackwork and the other is studying the subject of rail corrugation. While it is not expected that either committee will be able to conclude its work this year or that definite conclusions may be presented, it is reasonably certain that both committees will have some interesting data to present and that the reports will represent valuable contributions to the present knowledge on the respective subjects.

Manganese steel has served its purpose very well, but without heat treatment it is very difficult to secure a good weld, and heat treatment in the field is not practicable. These things have led the electric railway engineer to seek a substitute that would lend itself more readily to field welding and at the same time possess the necessary shock and abrasion resistive qualities, and thus postpone as long as possible the date of replacement. The advances made in the art of electric welding, both in the matter of equipment, technique and welding material employed, have been largely responsible for this demand for a substitute for manganese steel.

The cause of rail corrugation and its cure have long been subjects for discussion among street railway men. Rail corrugation also has attracted considerable public attention because of its noise-producing effect. Much has been written about it and many reasons advanced as to its cause. Still it seems to occur under so many different conditions that it would appear we really know very little about it. Considerable scientific study has recently been given the subject abroad and it is sincerely hoped that we may finally diagnose the ailment correctly and thus remove one of the most annoying and expensive troubles with which the street railway engineer has had to contend.

"Hand Grasps Hand, Eye Lights Eye"

TENSION is growing throughout the industry as the opening day for the Cleveland convention draws near. Machines and appliances that will tell the physical story of progress are being rushed to the exhibit hall. Those who are charged with revealing the mental story of what has been achieved, of what they believe lies beyond the inscrutable veil of the future are weaving thoughts into words. Speaker, exhibitor and delegate are realizing the great responsibility that such a congress imposes. It is inspiring to think of this great machine of human and material parts gradually gathering momentum and tuned for full speed ahead when the president's gavel shall give the signal.

Yet the whole concept of machines, speeches, debates and constructive legislation is as sounding brass and tinkling cymbal if one neglects the spirit that motivates the gathering. For more than two score years men of the electric railway industry have seen mechanical miracles in their field. They have seen a crude crawling vehicle, an unstable experiment, become the swift and powerful servant of mankind. They have trod the heights of success and groped through the valleys of failure. Spurred on by machines? No! but by the faith and trust of their co-workers. That has been revealed through gradual

culture of kind intercourse. Confidence in a man's friendship has meant more than the stereotyped phrases of a contract; faith in each other's word more than the scintillating perfections of steel and wire. To deny that acquaintanceship is the loom upon which is woven the material good of these conventions the JOURNAL thinks is impossible in the light of its years of observation. Impossible, when each of us has found that these contacts are "the mysterious cement of the soul, sweetener of life and solder of society."

What joy, then, is in store for us during the first week in October, when

Hand clasps hand, eye lights eye
In good friendship
And great hearts expand
And grow one in the sense of this world's life.

Discretion in the Payment of Income Bond Interest

ANOTHER interesting financial question which involves the issue of the possible substitution of the judgment of outsiders for that of the corporation management has arisen in New York. A holder of \$35,000 par value of adjustment income bonds of the Third Avenue Railway threatens suit to compel payment of the full 5 per cent annual interest, although on this issue there is a present accumulation of 27½ per cent as of Oct. 1.

It is a nice point in corporate management that is raised. Under some circumstances the threatened action might be justified, but not in the present instance. At the outset there is dispute about a question of fact between the threatening litigant and the management. The man about to sue says he has employed counsel to estop the company from using the property of the bondholders for capital purposes "in direct violation of the trust indenture securing the bonds." The management says that the indenture provides that disbursements on the bonds are at the discretion of the directors. The latter seems to be the more reasonable of the two provisions, for it is in accord with the general theory which applies to an issue of this kind.

Questions of law and of fact may have to be passed upon, but there can be no question about the wisdom of the policy of the management. It would seem reasonable to assume that the holder of a security of this kind labors under no delusion about the type of security he is purchasing. He knows that financially its ownership implies hazards. And those hazards are lessened for him only as the management exercises caution. It might, it is true, seek as soon as possible to liquidate the payments that have accumulated and denude the property of cash so quickly as to leave it again in the position out of which grew the necessity for issuing the income bonds. If it did that knowingly, it would not be true to its trust. And the present management of the Third Avenue Railway has been true to its trust.

Operations for the year ended June 30, 1927, showed approximately \$250,000 above the 5 per cent on the adjustment bonds, but some of the last year's earnings were non-recurrent in character. So well did the company do, however, that extraordinary payments of about \$50,000 were made out of surplus for expenditures not chargeable to operating expenses. The credit of the company is, of course, none too good, and in order to avoid the sale of securities at a sacrifice, the company has for the last ten years financed itself out of the sur-

plus. Despite this the railway has in its treasury available for all purposes about \$1,500,000. This is none too much considering that the company has been confronted with conditions extraordinary in their possible adverse affect. These have not been entirely removed by the granting of bus franchises to the railway in the Bronx, though the action of the Board of Transportation in so recommending would appear to have helped the situation immeasurably. The owner of the bonds, however, sees the matter differently. He pretends to scent disaster ahead in impending expenditures for bus operation.

Under the fast changing conditions in New York City with respect to population and modes of movement available to the prospective passenger, transportation men are agreed that its management has in many respects worked wonders with the Third Avenue Railway. But that apparently is not a judgment which weighs very much with the holder of these securities, by their very nature speculative in character, to whom immediate prospects are much more important than future potentialities. The projected suit deserves the dignity of mention only because it shows the length to which the holder of securities will go who is intent upon exacting his immediate pound of flesh.

Replenish Your Well of Ideas

FEW men generate ideas. Rare is the individual who can draw water from his own well, for that is one of the marks of genius. We cannot all aspire to genius, but we can nevertheless progress and improve by utilizing the experience of others. The coming convention affords a well of ideas, constantly replenishing, from which every member may draw a bucketful of transportation working facts.

The meetings of the American Association and affiliated associations will present a valuable picture of the industry as well as a cross-section of it. Financing, traffic regulation, franchises, advertising, fares, valuation and other subjects of importance will be discussed at round-table conferences. The progress in the industry will be stressed; feature accomplishments of the year on properties in different parts of the country related in five-minute talks by operating executives.

Questions to be asked and answered include "Does aggressive property-wide rehabilitation pay?" "How are you meeting the transportation needs of your community?" "How did you change an unprofitable bus operation to a highly profitable one?" and others vital to the industry. At the meeting of the affiliated associations important problems and various phases of accounting, claims, engineering, transportation and traffic will prove other wells from which to draw.

It is indicated that there will be some surprises in store for delegates in the way of new car and truck designs which will prove well worth studying. It is also promised that this year "the exhibit will be the greatest display of local transportation equipment the world has ever seen." De luxe cars and buses, articulated cars, the latest designs in lighting, heating and ventilating and upholstery will be displayed. Fare boxes, motors, track equipment, car and bus seats, wheels, steering gear and the many other exhibits all offer suggestions for providing better transportation.

Delegates to the convention will have a real opportunity to draw deeply from a well that sparkles with new ideas—provided they go to Cleveland determined to get full value for their money.



Fountain Square, Fifth and Walnut Streets, Cincinnati—Proposed terminal of the rapid transit line

Co-ordination Essential for Rapid Transit in Cincinnati

ARTICLE I

UTILIZATION of existing facilities to the greatest extent is the outstanding feature of the report on rapid transit recently made by the Beeler Organization of New York. The report was presented to the special committee representing the Council and Board of Rapid Transit Commissioners of the city of Cincinnati and the Cincinnati Street Railway on Sept. 9, as outlined briefly in this paper for Sept. 17, page 534.

The report goes into great detail to determine what should be done to provide rapid transit for Cincinnati, and whether a rapid transit system should be operated independently or in conjunction with other facilities. The following article and the one to appear next week are abstracted from the report, which is a printed volume of 166 pages.

In many respects the transit situation in Cincinnati is unusual. As early as 1912 a rapid transit commission was appointed, the primary purpose being to construct an entrance into the central business district for the various

Report of Beeler Organization to the city shows that the only practical way to use existing investment in subway lines is in conjunction with the street car and bus system. This article, the first of two, shows the physical plan for extending the subway line

interurban lines reaching the city. Later studies modified the plan and in 1916 the construction of a line was authorized and funds were appropriated. Due to the war the project was deferred, but since then the entire amount of \$6,100,000 has been spent in construction of the line. About 10 miles of double-tracked right-of-way is largely completed.

A portion of the route is along the bed of the old Miami and Erie Canal, which has long been abandoned.

The topographic map on page 543 shows the location of the line. The portions between Canal and Walnut Streets and Fountain Square and between Forest and Oakley have not been built. The remainder is a combination of subway and open cut. The stations are completed only in the rough, and none has been built between Clifton and Oakley or at Fountain Square.

In the intervening period since the project was begun most of the interurbans have been abandoned and those remaining have suffered decided decreases in their busi-

ness, so that the construction of the rapid transit line is not justified from an interurban standpoint. As the rugged topography of Cincinnati imposes unusual difficulties on its transportation facilities, the easy grades of the partially completed rapid transit line appeared to present a possible solution to real rapid transit service within and adjacent to the city. If such service can be provided at a cost that will warrant its undertaking it will benefit a large area of rapidly growing territory and at the same time enable the city to receive benefit from the large investment already made.

The purpose of the present report is to set forth the results of an investigation of the rapid transit situation made for the purpose of determining if the project (a) should be abandoned; (b) should be equipped and operated as it now exists; (c) should be completed and operated in accordance with any existing plan, or (d) should be completed and operated in accordance with other plans. If the line is to be completed and operated a feasible plan is needed, stating (a) whether or not the line should be operated independently or co-ordinated with other necessary transportation agencies; (b) what changes should be made in existing transportation facilities as the result of operating the rapid transit line, and (c) the financial results of operation of the rapid transit line.

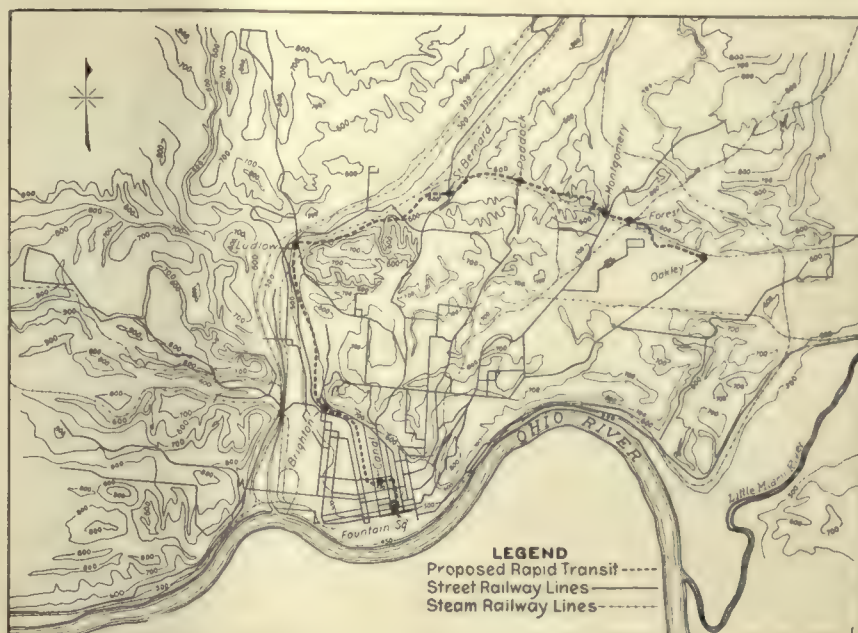
TOPOGRAPHY OF CITY AN IMPORTANT FACTOR

Cincinnati grew up as a river town and in the days of its early great expansion all of its commercial and industrial life depended on the river. The topography of the city is important. In Cincinnati there are more hills and valleys than in any other city in the Union. It is the hilltops that have given the city suburbs unequalled for variety and beauty. These hills and valleys are a problem to industry. The level plain on which the old city was built has long been well filled. It is inevitable that Cincinnati should look for its future expansion to far-flung industrial districts with distances from Fountain Square that might be called metropolitan.

The business section, known as the Basin, is located on a plateau about 2 square miles in area, bounded by the Ohio River on the south and surrounded by bluffs from 200 to 300 ft. high on the other sides. Most of its residential population lives on these bluffs, so that the transportation problem largely becomes one of carrying people up and down the heights. The situation is shown on the topographical map. There are only three level approaches to the Basin district, two along the river, east and west respectively, and a third along Mill Creek, which follows a semi-circular path in getting into the Basin. All three approaches are narrow and are utilized to capacity by steam railroads, highways and street car lines.

ABOUT A HALF MILLION PEOPLE IN DISTRICT

About 410,000 people reside within the corporate limits of Cincinnati. The local transportation agencies, however, serve some 460,000 people in Ohio. The city of Norwood, with 30,000 people, is almost surrounded



Topographical map of Cincinnati and vicinity

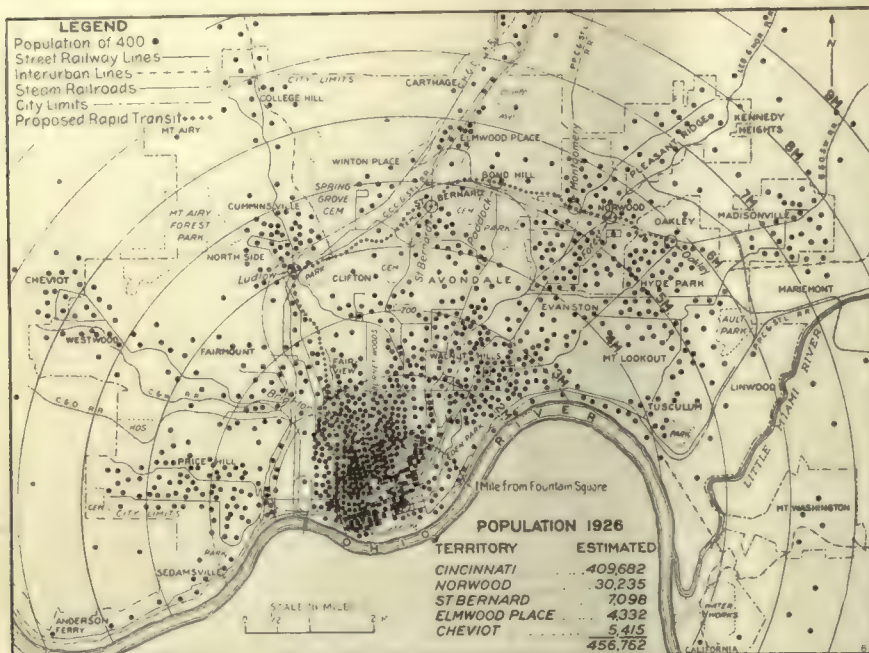
by Cincinnati, while the municipalities of St. Bernard and Beechwood Place, with an aggregate population of 11,000, are entirely within its corporate limits. The smaller contiguous municipalities served make up the Ohio total. In addition the territory across the river in Kentucky, including the cities of Covington and Newport, and the smaller adjacent communities, with an aggregate population of 125,000, increases the transportation requirements of Cincinnati, as about 70 per cent of the working population in that territory is employed in Cincinnati.

The increase in growth for various periods is shown in the chart on page 546. The curve for Hamilton County gives a more nearly correct picture of conditions. The curve for Cincinnati is affected by annexations. The city had its greatest growth between 1840 and 1850, increasing 150 per cent.

Local transportation on the Ohio side is cared for by the Cincinnati Street Railway, independently operated buses and the private automobile; local traffic handled by the steam railroads is almost negligible. The fare on the street cars is 10 cents cash or three tickets for 25 cents. The minimum fare on all buses is 10 cents, and this is increased by 5-cent steps on some of the longer routes.

The trend of passenger traffic is shown by the chart on page 546. The number of revenue passengers increased at quite a definite rate until about 1913. From then until 1920 the number of passengers continued to increase, but at a lower and more irregular rate. Since 1920 the curve has been very irregular and quite decidedly downward. This can be attributed to at least three factors—increases in the rate of fare, increases in the number of automobiles, and more recently to independent bus competition. Independent buses commenced operating in large numbers in 1925, but the number of passengers carried in that year is not shown because no data are available.

For the last few years the company was losing patronage up to Nov. 1, 1925, when under a change in operations and a new franchise a reduced fare went into effect, resulting in an immediate upward trend in passengers carried. Since it engaged in the operation of



Distribution of population, Cincinnati and vicinity

buses early in 1926 the rate of increase has been accelerated, but unfortunately bus operation is increasing its total operating cost faster than its total revenue.

Besides the railway company's buses there are sixteen independent bus routes owned by five different companies and operating approximately 90 buses in local service. These buses are operating about 5,311,000 bus-miles and carrying some 13,300,000 local passengers annually. No information is available as to the financial results of their operation. In addition to these, 23 interurban bus lines have their terminal in Government Square, but do no local business within the city limits. It is questionable if any of these can be routed to the rapid transit line without lowering the quality of their service, as passengers, especially those with baggage, object to a transfer en route. It may be, however, that the rapid transit line may furnish a valid reason for terminating some of these interurban bus lines, especially the shorter ones, at its stations, thus removing just that much more traffic from the downtown streets and giving the rapid transit lines more business without impairing the service, because while a transfer will be required from bus to subway it will give a quicker ride.

AUTOMOBILE AN IMPORTANT FACTOR

The private automobile is a factor in the local transportation situation which merits serious consideration. In the last five years the number of automobiles has increased 111 per cent in the state and 126 per cent in Hamilton County. There are now 88,000 passenger automobiles registered in the county. Checks in other cities have shown that about 15 per cent of the registered automobiles enter and leave the downtown section of the city daily. On this basis the automobiles of Hamilton County would carry some 16,000,000 riders in and out of the Basin annually. This makes no allowance for automobile rides which do not enter the Basin or for passengers carried on trucks. With these figures in mind it is not difficult to understand that the automobile has a serious effect on public transportation agencies.

Generally speaking, daily movement of the people originates and terminates at their residences, though of

course other movements are made between the time they leave home and return. No census or even estimate of population by districts had been made since 1920. It was considered most desirable to obtain population figures for 1926, because while there has been no rapid growth in the total population of Cincinnati and vicinity, quite appreciable differences have taken place in the distribution of the population. Several methods were considered for bringing the 1920 census figures up to date, but the only two that were found sufficiently helpful to warrant their use were extensions of the 1920 census and a study of the report of the city planning commission, which established factors between total population and elementary school enrollment for each school district. As a result of these studies, the estimated population was derived as follows: Cincinnati, 409,682; Norwood, 30,235; St. Bernard, 7,098; Elmwood Place, 4,332, and Cheviot, 5,415, making a total of 456,762 in the territory. There is a further population of about 23,000 in the various other communities immediately surrounding the city and about 112,000 in the Kentucky territory immediately tributary to Cincinnati, making a total of approximately 600,000 people who may be considered as living in and immediately adjacent to Cincinnati.

On account of rapid changes in conditions, the riding on the public transportation lines was determined for the months of September and October, 1926, rather than an average for the year. It was found that the cars of the Cincinnati Street Railway carried on an average 7,600,000 passengers per month and the railway buses 583,000 passengers, or 98,200,000 passengers carried annually by the street car and bus lines of the company. It was estimated that the independent buses carry about 13,300,000 local passengers annually, making a grand total of 111,500,000 revenue passengers to be moved annually by the local transportation agencies in the Cincinnati district. It was also estimated that 4,400,000 annual rides were taken on the Cincinnati lines by persons residing in Kentucky.

Deducting from 111,500,000, the total rides in city service, the 4,400,000 rides originating in Kentucky and the 3,792,000 originating in other outlying sections, 103,308,000 rides remain as the number originating from the 462,000 people accounted for in the area studied. Dividing the number of rides by the population results in a figure of 224 as the average number of rides per capita. Dividing 111,500,000, the total annual rides, by 224, indicates that the local transportation lines are serving the equivalent of a population of 515,000. Further calculation was made to obtain the riding by districts.

BUSES ON CENTRAL PARKWAY NO SOLUTION

Calculations were made as to the number of riders that buses operating on Central Parkway would serve and save time as compared with present facilities. The time saving to the sections in the eastern portion of the city as compared with the present more direct routes downtown would be practically negligible or negative. Under ordinary circumstances it was estimated that the

running time of buses operating between Knowlton's Corner and Fountain Square by the Parkway would be 21 minutes each way. This compares with 28 minutes required at present by street car, 25 minutes by bus and 12 minutes on the proposed rapid transit line. The run between Fountain Square and Knowlton's Corner represents the maximum saving in time possible by buses operating on the Parkway. On the assumption that all riders who could save time would use buses instead of street cars and that the public would be satisfied with bus service instead of street car service in this territory, it was estimated that 16,200 people would use buses daily between Knowlton's Corner and Brighton and 10,200 more between Brighton and the Basin, making a total of 26,000 daily or 8,972,000 rides annually. This estimate is based on the supposition that all the riders now using the car lines beyond Brighton would be carried on the buses that would operate over the Parkway. Buses at the rate of 78 per hour north of Brighton and 138 per hour south of Brighton would be required to transport these riders during the peak load periods. As in the case of the rapid transit lines, these buses to serve the riders properly must operate to some point in the vicinity of Fountain or Government Squares. The addition of 138 buses per hour in each direction to the present downtown rush-hour traffic would of course be a backward step in minimizing traffic problems.

It will be seen from comparing present street car schedules with those of the proposed bus and rapid transit lines that buses will reduce the running time to Knowlton's Corner 25 per cent, while the rapid transit line will reduce it 58 per cent. From a standpoint of time saving alone buses will benefit approximately 9,000,000 riders annually, while the rapid transit will benefit more than four times that number. A rapid transit car with a carrying capacity several times that of the bus can be operated at a cost not to exceed that of the bus. The rapid transit is underground in the congested district and on its own right-of-way elsewhere, so that its operation improves traffic conditions by removing all of this traffic from the street surface, while the bus does exactly the opposite. The engineers could not, therefore, find any ground upon which to base further consideration of the use of buses on the Parkway as a substitute for the rapid transit line.

STOPS SHOULD BE MINIMIZED

The primary purposes of rapid transit are to save time, reduce street congestion and increase the metropolitan area of the modern city in order that its citizens may live in more healthful and inviting localities than alongside their work. In Cincinnati the problem is threefold: (a) To get the people in and out of the Basin; (b) to distribute them quickly to various communities necessarily quite widely separated because of topographic conditions, and (c) to enlarge the area available for industrial and residential development.

Speed, regularity and frequency combined are essential to the success of rapid transit in Cincinnati. Only in this way can patronage be attracted to the line and thus



Looking north along Central Parkway, prior to completion of automobile roadway

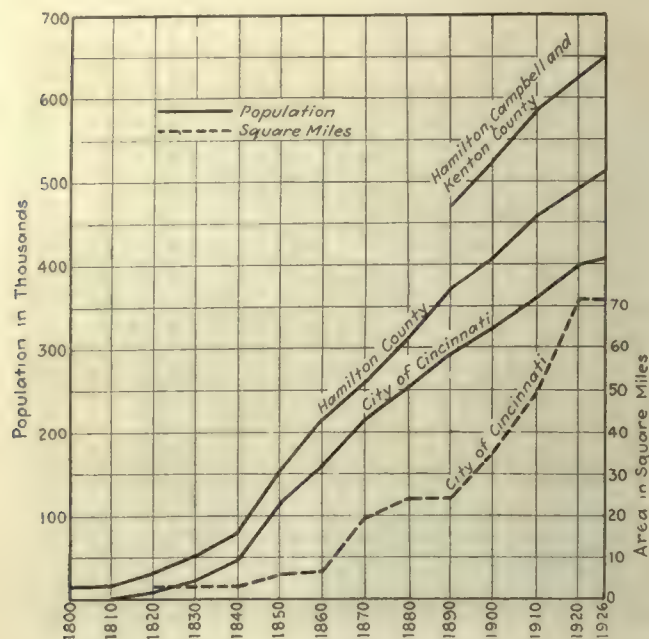
reduce the number who desire to enter the congested section on the surface by public or private conveyance.

Factors influencing the speed and regularity of a rapid transit line are the grade and alignment of the route, power conditions, motor equipment, length of stop and number of stops. The last is by far the most important. The effect of adding a station, which of course involves an additional stop, on the rapid transit line is such a serious matter that it is well worth while to consider what it means, for it looms large not only in the dollars and cents cost, but in destroying the very thing that rapid transit is designed to accomplish—speed. The effect of a stop depends on so many variable factors such as the number of trains, the number of cars in the train, cost of station operation and cost of the station itself. For the type of service proposed for Cincinnati the cost of operating the rapid transit system would be increased \$35,000 to \$40,000 per year for each added station. Besides this it delays every person using the service other than those using that particular station about $1\frac{1}{2}$ minutes on each ride. This means that each station stop adds about three minutes to the scheduled running time of each trip. With a three-minute space between trains an added train must be placed in service for each stop.

Obviously there is little question but that the greater portion of the existing line that is graded can judiciously be made a part of any rapid transit line recommended because service can be operated much cheaper on a rapid transit line than on a surface line if the cost of providing the rapid transit right-of-way is disregarded, which may be done in this case since the investment is already made and if not utilized will be a total loss. The problem in Cincinnati then becomes one of determining whether at a cost that will not be prohibitive additions or changes can be made in connection with the existing line to make it possible for it to function so as to provide the city with a practical rapid transit service.

Several plans for a belt line, utilizing the existing rapid transit line with a return through Duck Creek valley, were investigated. On account of the relatively small population that would be served none of these plans was approved.

It is recommended that the line be extended from



Population Cincinnati and vicinity, 1800-1926

its present terminal to Madison Road, Oakley, as it will increase the territory served by a material amount at a relatively low cost. The reservation is made, however, that this will hold only if no more stations are permitted than those specified in the report, as otherwise the time saving to Oakley would not be sufficient to warrant the extension and operation of the line.

EXTENSIONS WILL ENHANCE EXISTING LINES

It also is the opinion of the engineers and others that the possibility of its successful operation is contingent on extending the line from Central Parkway and Walnut Street to some point in the vicinity of Fountain Square, which would better serve 47 per cent of the people who would use rapid transit. A rough estimate indicates that about 40 per cent of the line's total patronage would be contingent on its extension to Fountain Square.

An investigation was made to determine whether the route of the rapid transit line as already built is the most satisfactory or if changes could be made to advantage. Particular attention was given to the location of the Ludlow station. The line follows the old canal running east of Mill Creek and the B. & O. Railroad in the vicinity. The existing station is located at the south end of the Ludlow Street viaduct. This is at the end of the Central Parkway and automobile traffic will be heavy over the viaduct to Knowlton's Corner, as the Parkway will become the main artery between downtown and that part of the city lying to the north of the point where the Parkway will intersect Ludlow Avenue. To have the surface cars and motor buses that should feed into the rapid transit line cross the viaduct would add materially to the congestion and it would be much relieved by having them reach the rapid transit line at Knowlton's Corner.

It was estimated that with the station located as at present some 2,356,000 people will enter and leave it annually, while if it is relocated as proposed the number would be increased to 4,036,000. In the former case practically all would have to be transported, as 1,600 ft. is farther than people will walk, especially if car service is available. It would require five or six minutes time to walk to the station and from two to three minutes to

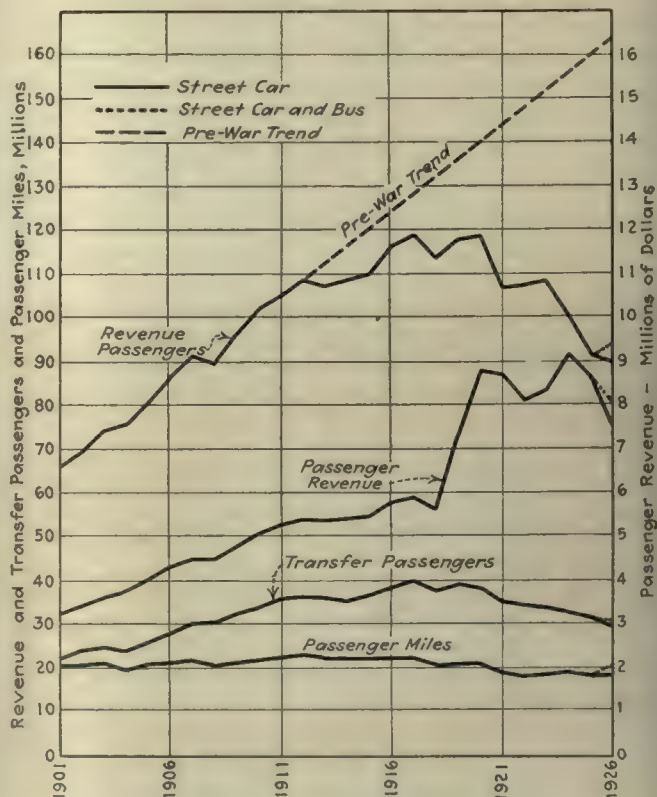
ride to it from Knowlton's Corner. In the new location the additional 1,080,000 rides which would originate at the rapid transit station if located at Knowlton's Corner would continue to use the surface cars if the station is not relocated. It is estimated that the line can be relocated at a cost of \$716,000, the amount covering the cost of construction of the line and station, acquiring the right-of-way, and any incidental damages involved. The loss of investment in the present right-of-way and station probably does not exceed \$150,000.

Studies were also made of the locations of several of the other stations along the line. Those at Liberty Street, Marshall Street and Clifton Street were found unnecessary and their abandonment was recommended. It was also recommended that all stations yet to be constructed be built with island platforms, with a mezzanine floor above. This will allow one attendant to sell tickets or make change for trains in either direction.

Prepayment areas into which surface cars and buses can be run for transfer of passengers to the rapid transit line without the use of paper identification tickets are recommended at Brighton, Ludlow, St. Bernard, Montgomery and Oakley stations. The plan proposed is similar to that used by the Boston Elevated Railway at various points.

INTERURBAN TO SERVE SUBURB

The Cincinnati, Hamilton & Dayton Railway, which passes through the College Hill territory and terminates at Spring Grove Avenue, is the only remaining interurban in a position to benefit by utilizing the rapid transit line as an entrance to downtown Cincinnati. With suitable equipment its cars could operate over the proposed rapid transit line directly to Fountain Square. Both the interurban and the Cincinnati Street Railway use the same street through the center of the College Hill territory. If the interurban were to run through and would give



Passengers, revenue and miles, Cincinnati Street Railway, 1901-1926

local bus service in College Hill to enable the residents to reach the car line it would serve the territory much better than the Cincinnati Street Railway.

There are some 3,003,609 annual riders in this territory, of whom 1,620,600 are carried by the street railway and the remainder are divided between the C., H. & D., the steam railroads and the interurban buses. Assuming that the rapid transit line is completed by 1930 it is estimated that the traffic will increase to 6,655,310 riders by 1940 and 8,434,011 by 1905. The running time between Fountain Square and College Hill, now 42 minutes by street car, would be 26 minutes. The time from Fountain Square to the railroad station and thence to Hamilton by the fastest steam railroad train is 66 minutes and by bus 75 minutes; the new time on the interurban will be 55 minutes. Other points will be affected accordingly.

By making this arrangement the total undeveloped land area which could be reached within a total time of 60 minutes would be increased from 2,313 to 10,405 acres.

Should the interurban be accorded the right to operate to Fountain Square via the rapid transit line it should agree substantially to (a) pay a rental based on the miles operated; (b) provide the type of equipment necessary to conform with that operated on the rapid transit line; (c) connect its line at Spring Grove Avenue with the rapid transit line by means of a viaduct extending over Mill Creek, eliminating the grade crossings of Spring Grove Avenue and the B. & O. Railroad.

Pittsburgh Introduces a New Chair Car Service

INDIVIDUAL bucket-type seats have been used by the Pittsburgh Railways in the equipment of one of its latest type low-floor, one-man, two-man cars. These seats have spring cushions and cane covered backs with leather binding around the top. The rear side of the seat back is covered with sheet steel to prevent the cutting and marring that frequently happens with cane covering.

Arrangement of the seats is unique in that they are in a single row along each side of the car. Each seat



A rear view showing the seating arrangement of the chair car, the stanchions and the one-level floor

is placed at an angle of 45 deg. with the side of the car, thus forming the "saw tooth" line-up as may be seen in one of the illustrations. This gives the desirable effect of privacy to each seat which could not be so well obtained in any other way without the sacrifice of considerable space.

Access to these seats is free at all times for the reason that one does not interfere with the one next to it. Patrons may be seated quickly and may reach the doors easily when leaving since each seat faces the aisle.

An additional convenience and safeguard is provided in the porcelain enamel stanchions which are placed beside each alternate chair throughout the full length of the car. The stanchions on one side of the aisle are staggered with respect to those on the opposite side, thus providing one upright for each seat space along the aisle. These stanchions, together with the longitudinal hand rod above the seats, replace the porcelain enamel hand straps which are standard equipment on this series of cars.

Another feature which is being tried out in this unit is the straight floor line throughout the car. Up to the present time the standard arrangement for low floor cars with center doors has consisted of a low floor at the center doors with a ramp leading to the front and rear sections of the car. This particular car has that part



The chair car ready for service. Note the low floor of the car

of the floor raised to the same elevation as the rest of the floor. This necessitates an additional step at the center doors but does not appear to have any appreciable effect in slowing up loading. In the remodeled car, which is now arranged for one-man operation only, the center doors with the additional step could have practically no effect because these doors are used only at heavy loading and unloading points in the city loop, which is only a small fraction of the number of stops the car would make in a trip.

There is no doubt that the appearance of the car in the interior is improved by this new floor arrangement. There is, however, a distinct advantage in this arrangement to passengers who are walking in the aisle when the car is in motion. It is not nearly so difficult to keep one's balance on the straight floor as it is on a sloping one. This type of floor, together with the many stanchions, thus makes it safe for many women patrons who would otherwise not risk their footing in a moving car. A package shelf is another convenience afforded in this unit. This has been placed between the seats and the sides of the car.

Provision has been made for a bulletin board which extends from the ceiling in the center of the car. On this board is carried a notice asking for comments on the seating arrangements of the car. The notice has brought to the commercial department many comments of praise and congratulations on the agreeable type of service this car is providing. Some automobile riders have expressed their complete satisfaction with the unit as a substitute for their own private cars for trips to the city. In fact, all who ride the car appear to be favorably impressed by it.

The car has been operated from the Craft Avenue carhouse on several routes where one-man units are in service. It will later be tried on several other lines of the system which are operated through the better residential districts and where automobile competition is very noticeable. The results of these trial runs will have a distinct bearing upon the future of this type of service in Pittsburgh. If it is found that off-peak traffic can be sufficiently increased by this service, it is very probable that one or more chair cars of this type will be built.

London Railway Headquarters to Cost \$1,665,000



Head office building to be erected by the Underground Electric Railways Company of London

CONTRACT for the construction of the large new building to be erected upon the triangular site of the London transport combine at Westminster, London, to serve as the headquarters of the London underground railways, the London General Omnibus Company and associated companies, has been placed with a London concern on a tender of £333,000 (\$1,665,000). The building will require 4,500 tons of stone and 2,500 tons of steel for the frame of the structure. It will have ten stories and a tower and will be 173 ft. high.

The building is scheduled for completion at the end of 1928.

Tennessee Electric "Saying It" with Newspapers

THE KIDDIES ARE SAFE ON STREET CARS

Vacation time is here. For the kiddies, what a wonderful chance to enjoy healthful outdoor life. There's plenty to see and do in and around Chattanooga every day. And street cars will transport your children to many points of interest in safety and comfort.

A few suggestions:

Miles—On Mission Ridge, Lookout Mountain, Chickamauga Park.
Swimming—Warner Park, McCallie Lake.
Tennis—Jackson and Warner Parks, Cameron Hall, Custer Cemetery Park.
Baseball—Andrews Field, many Amateur Games.

A Day Outdoors—then Home by Trolley



STREET CARS— ALLIES OF INDUSTRY

Thousands of men and women whose busy hands and brains keep Chattanooga in the forefront of Southern industrial progress are street car riders.

Every morning and evening—summer and winter—in good and bad weather—street cars are depended upon to transport this local army of 45,000 people in safety and comfort. And they save money by it.

Ride Street Cars—Cheapest Transportation in the City

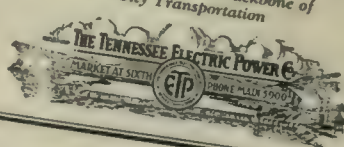


WE HAVE NO QUARREL WITH THE AUTOMOBILE

Motor cars have their place, especially for pleasure riding. But there are a lot of people, who drive to town each morning, and leave their cars to the mercy of the elements all day, just to drive back home at night.

To these people we say that street cars offer the safest and most economical medium of transportation. Why not ride for 7 cents and save your auto for pleasure driving with the whole family?

Street Cars are the Backbone of City Transportation



Combining consistent arguments with what Advertising Manager J. C. Costello of the Tennessee Electric Power Company, Chattanooga, declares "inexpensive

newspaper advertising" the "Volunteer" state utility is making friends with its patrons by means of the copy shown above



Berlin's latest surface motor car has two center doors and is fitted with Cardan drive.
This method of operation is still under trial in Berlin

Berlin Practices Co-ordination in Transportation

Policies of rapid transit, bus and surface car line directed by a single commission. Traffic is constantly growing. Operating problems differ somewhat from those in America's largest cities

By Henry W. Blake

Senior Editor *Electric Railway Journal*

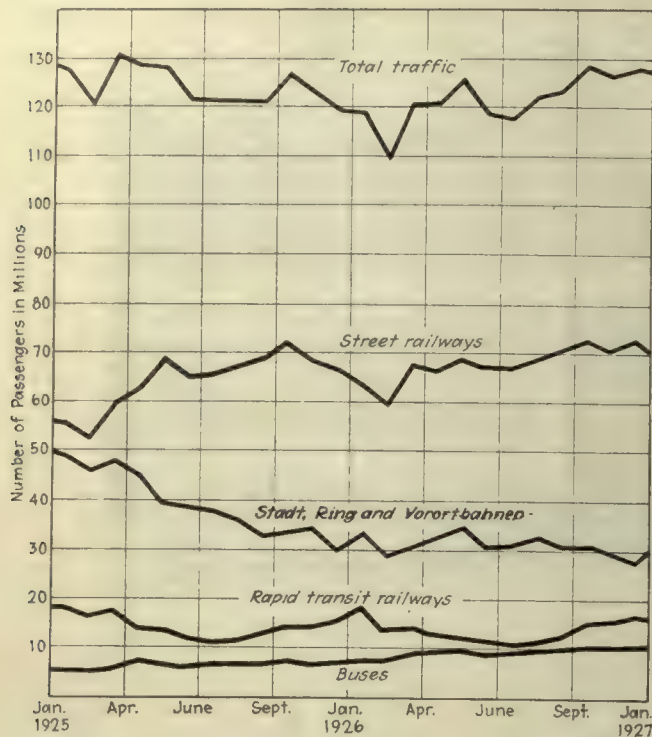
BERLIN is one of the very few large cities in the world in which the bus service, rapid transit lines and street railways are under one management. This is not true of London, where the buses and rapid transit lines are under one control and the principal street railway lines under another, nor is it true of Paris, or of New York or Chicago. In Philadelphia all of these services are under a single management, but free transfers are not given between all of them. Boston also has them under one management, but Boston is much smaller in number of inhabitants than Berlin.

The Berlin situation was brought about by the outright ownership by the city of one of these properties and a purchase by it of a majority of the stock of the other two, following the close of the war.

The city owns the entire surface line system, having taken it over during the inflation period for 20,000,000 gold marks (about \$5,000,000). As a conservative estimate of the value of the property before the war was 300,000,000 marks, it will be seen that the city acquired the property for only a small proportion of its real value.

In each of the other transportation agencies the city has a majority stock interest. The elevated and underground system was organized in 1897, largely by the Siemens & Halske Company and the Deutsche Bank, and began service in 1902. It continued under private direction until 1926, when control was taken over by the city. Under this arrangement the company, which is known as the Hochbahngesellschaft, first absorbed two other rapid transit systems in Berlin, which had been built later and physically were really extensions of its own lines but had been financed independently. These properties were taken over by the exchange of their stock for stock of the Hochbahngesellschaft. Then the city purchased 69,755,000 marks par value of the Hochbahngesellschaft stock, paying therefor in 7 per cent interest-bearing certificates, leaving only 8,517,000 marks of Hochbahngesellschaft stock outstanding.

Of the capital stock of the bus operating company, the Allgemeine Berliner Omnibus Aktien Gesellschaft, the city owns about 8,000,000 marks, leaving only about 2,000,000 marks floating.



Monthly division of traffic between different agencies in Berlin

It has been the policy of the city to continue to operate these systems by private companies with separate officials for each, but to secure unity of policy and co-ordination of service through a single directing commission.

A governing reason for the retention of operation by stock companies was that the original owning corporations had outstanding obligations in regard to bond retirements and other matters which could be fulfilled better by a private company than by the city. Practically, also, there is no doubt that the retention of the com-

portation matters, and two employees of the operating companies.

While the Aldermen are elected, there is not as much change in Germany in officials of this kind as in the United States, so that these members of the board are more permanent and less likely to be influenced by politics than probably would be the case in the United States. The four members of the city administration are the city councillor for traffic, its chief engineer, its adviser on traffic and its treasurer. These officers are appointed, not elected, and in practice have long terms.

The labor members vary with the topic considered by the board; that is to say, two representatives of the employees of the rapid transit lines sit with the board when the topic to be considered relates to the rapid transit lines, two from the surface lines for surface line questions and two from the bus company when the question at issue affects bus operation.

THE STADTBahn ALSO A FACTOR

While this commission directs the policy of the three companies mentioned, it does not control all the Berlin urban transportation agencies because of the existence of the Stadt- und Ringbahn, a standard-gage railroad extending around and across the city and with suburban extensions. This road is part of the German State Railroads system and was built some 50 years ago to form a physical connection for the steam railroads which enter Berlin from several sides. It also had certain military value in the mobilization of troops. Owing to its location, this road has always done considerable city and suburban passenger transportation business.

TABLE I—PASSENGERS CARRIED (IN MILLIONS) 1911-1926 ON THE VARIOUS SYSTEMS IN GREATER BERLIN

Year	Surface Lines		Stadtbahn System		Bus Lines		Rapid Transit Lines	
	Number of Passengers	Per Cent of Total	Number of Passengers	Per Cent of Total	Number of Passengers	Per Cent of Total	Number of Passengers	Per Cent of Total
1911	606	50.6	370	31.0	154	13.0	64	5.4
1912	638	51.1	388	31.1	159	12.7	64	5.1
1913	652	52.7	341	27.5	170	13.9	73	5.9
1914	607	49.6	383	31.3	156	12.7	79	6.4
1915	619	53.5	366	31.6	101	8.7	72	6.2
1916	716	57.7	370	29.8	74	6.0	81	6.5
1917	897	66.3	311	23.0	33	2.4	112	8.3
1918	1,056	69.2	344	22.6	11	0.5	117	7.7
1919	1,008	66.8	376	24.9	11	0.7	115	7.6
1920	784	55.3	528	37.2	11	0.4	101	7.1
1921	672	49.8	559	41.5	21	1.6	96	7.1
1922	520	38.1	693	50.7	33	2.4	120	8.8
1923	286	25.5	643	57.5	23	2.1	167	14.9
1924	530	42.9	474	38.3	48	4.0	183	14.8
1925	772	53.6	442	29.3	74	5.1	172	12.0
1926	813	55.8	371	25.5	113	7.5	163	11.2

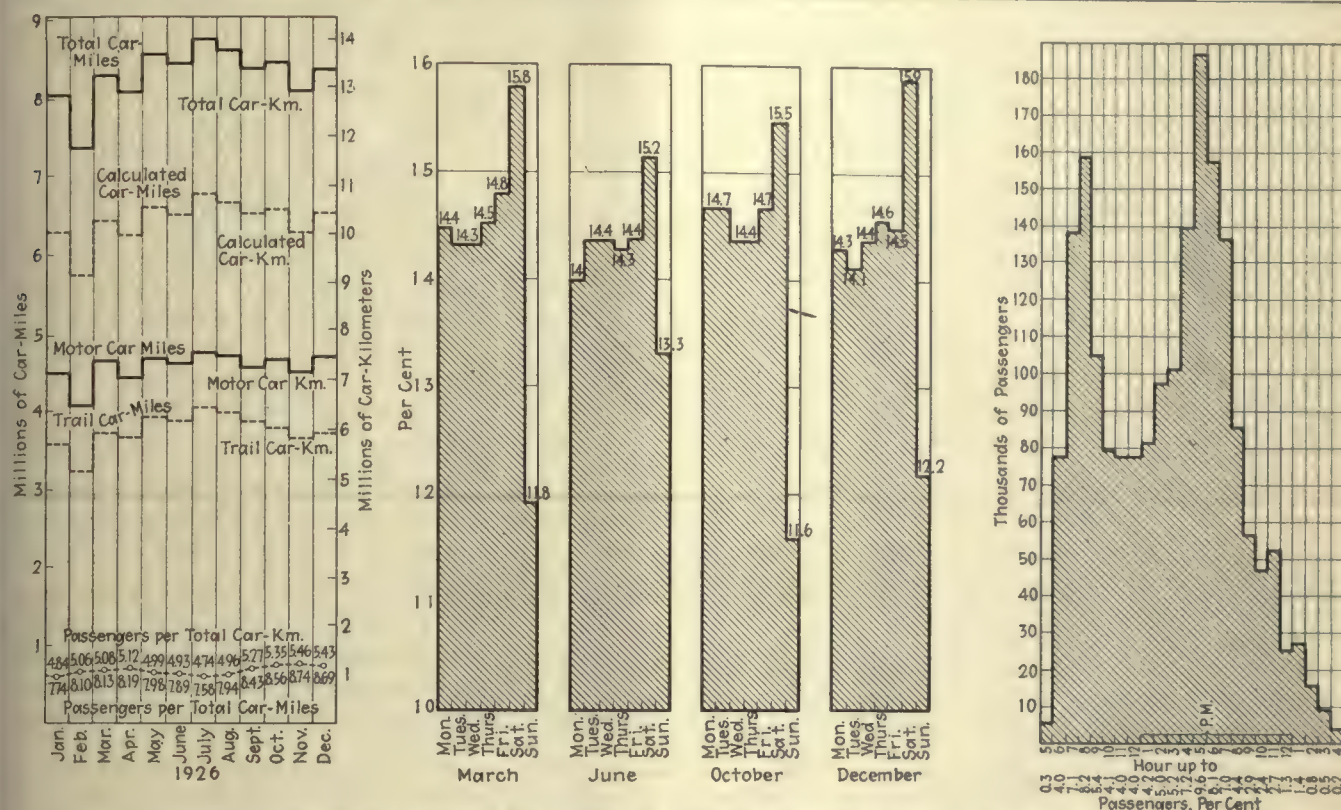
pany form of operation tends to remove the direction of the companies farther from politics than otherwise it might be.

GOVERNING COMMISSION OF SIXTEEN MEMBERS

The single governing commission for the three operating companies consists of sixteen members, made up of eight members of the Board of Aldermen, four representatives of the city administration, two distinguished citizens, who are selected for their knowledge of trans-



This chart was published by the Berlin Surface Lines to illustrate the comparative increase in the cost of material and labor used in street railway operation during the last thirteen years and the much smaller increase in the charge for transportation



Monthly, weekly and hourly load charts for varying periods in 1926, Berlin Surface Lines

At left, monthly load chart of car-miles car-mile and per car-kilometer. In center, months during 1926. At right, hourly load chart of passengers, Berlin Surface Lines, for calendar year of 1926, also rides per Berlin Surface Lines, for four typical for Wednesday, Dec. 5, 1926.

Operation of this line has been by steam locomotives up to within recently, largely because the government railroad authorities could not decide whether it should be equipped with alternating or direct current. A decision was then reached to equip two of the four tracks with the third-rail direct-current system for urban service, the question of the arrangement to be adopted later when through single-phase trains enter the city to be determined when the through trunk lines entering Berlin are electrically equipped.

With its new direct-current equipment, this transportation system should play an even more important part in Berlin's city transportation than in the past, at least in number of passengers carried. Whether it will increase its proportion of total passengers remains to be seen, because the street railway, rapid transit and omnibus systems are also making important improvements at the present time.

HOW THE TRAFFIC IS DIVIDED

The diagram on page 550 shows the division of traffic between the several agencies by quarters during 1925 and 1926, and Table I, the division by years from 1911 to 1926 inclusive. In the latter the fluctuations in recent years, particularly between the two principal transportation systems, will be noted. Thus, the street railway proportion, which was 69.2 per cent in 1918, fell to 25.5 per cent in 1923, but in 1926 had returned to 55.8 per cent.

Conversely, the Stadtbahn system, which carried only 22.6 per cent in 1918, was responsible for 57.5 per cent of the traffic in 1923. Its local traffic in 1926, amounting to 371,000,000 passengers, was about the same numerically as before the war and represented 25.5 per cent of the total. The period of its spurt, 1920-23 and extending into 1924, corresponds roughly to the time of great

currency inflation in Germany, when the street railways under private ownership were trying to raise fares rapidly enough to meet their financial obligations, whereas the fares on the Stadtbahn, under government ownership, were less susceptible to the devaluation movement in the currency.

TABLE II—DEVELOPMENT OF GREATER BERLIN TRAFFIC SINCE 1890

Year	Inhabitants Within the Boundaries of the Present Greater Berlin	Total Passengers Carried	Yearly Rides per Inhabitant
1890	1,960,000	234,315,000	119
1891	2,022,000	253,669,000	125
1892	2,084,000	268,226,000	128
1893	2,146,000	290,161,000	136
1894	† 2,208,000	306,007,000	139
1895	2,270,000	340,299,000	150
1896	† 2,358,000	391,121,000	166
1897	† 2,447,000	400,732,000	164
1898	† 2,535,000	441,429,000	174
1899	† 2,624,000	496,926,000	189
1900	2,712,000	545,899,000	202
1901	† 2,815,000	536,818,000	208
1902	† 2,917,000	628,037,000	215
1903	† 3,020,000	687,244,000	228
1904	† 3,123,000	758,426,000	243
1905	3,225,000	834,245,000	259
1906	† 3,327,000	919,024,000	276
1907	† 3,429,000	969,500,000	283
1908	† 3,531,000	987,200,000	280
1909	† 3,633,000	1,048,156,000	289
1910	3,734,000	1,125,094,000	301
1911	3,794,000	1,193,781,000	315
1912	3,901,000	1,247,973,000	320
1913	3,944,000	1,289,966,000	327
1914	3,804,000	1,224,700,000	322
1915	3,722,000	1,158,000,000	311
1916	3,625,000	1,219,000,000	336
1917	3,606,000	1,352,000,000	375
1918	† 3,700,000	1,499,000,000	405
1919	3,804,000	1,512,000,000	397
1920	3,664,000	1,424,500,000	369
1921	3,893,000	1,349,000,000	347
1922	3,926,000	1,318,000,000	336
1923	3,938,000	1,198,000,000	304
1924	3,941,000	1,248,000,000	317
1925	4,038,000	1,445,000,000	358
1926	4,139,000	1,460,000,000	353

† Estimated. All other population figures are taken from official municipal publications.

A still more striking evidence of the influence of the war and the inflation period following it is shown in the figures of passengers carried on the buses. In the years 1911-14 these varied from 154,000,000 to 170,000,000, but in 1918 had got down to 8,000,000 and reached their minimum of 6,500,000 in 1920, when rubber and gasoline were very costly. The 1926 figure of 113,000,000 is still somewhat less than the pre-war average, but during the first half of 1927 the bus traffic has been growing rapidly.

Table I shows a notable increase in total passengers carried during the past four years. This appears in a more extended way in Table II, giving total traffic figures for the past 36 years, with the population of the district known as Greater Berlin and the rides per inhabitant.

ADOPTION OF UNIVERSAL TRANSFER A NOTABLE EVENT

The most notable event in Berlin traffic history since the acquisition of the three local systems by the city was the decision this year to adopt the same fare for all lines with practically universal transfers. The fare chosen was 20 pfennigs (5 cents) and includes a transfer from bus to rapid transit or surface line and between these two. As yet transfers are not given by them to the

TABLE III—SHOWING STREET ACCIDENTS IN BERLIN, RESPONSIBILITY THEREFOR AND THE NUMBER OF VEHICLES OPERATED, BASED ON DATA FROM THE BERLIN POLICE TRAFFIC DEPARTMENT

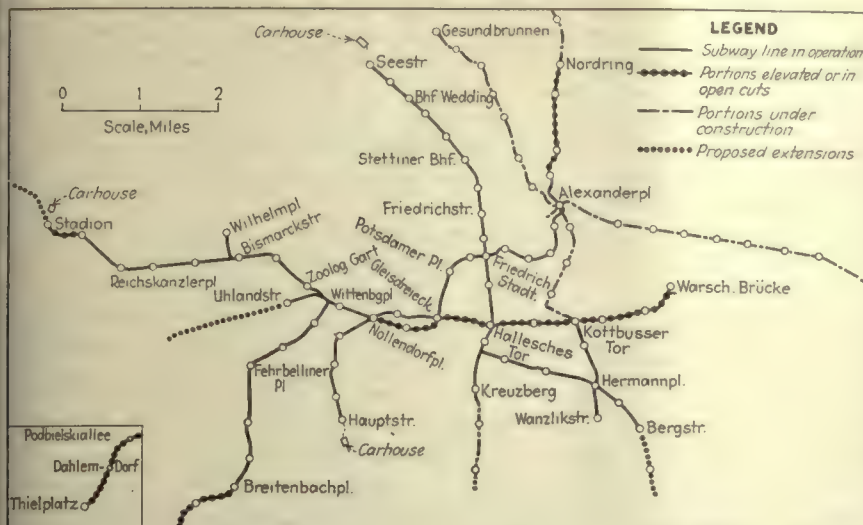
	Number of Power Vehicles on Street, Count Taken Dec. 31, 1926		Number of Accidents During 1926 and Responsibility Therefor, as Determined by Police Traffic Department		Responsibility of Motor Vehicles for Accidents, Based on Number Operated
	Actual Number	Per Cent of Total	Actual Number	Per Cent of Total	Per Cent of Total
Private automobiles...	15,900	29.5	1,697	20.0	12.8
Motor taxicabs.....	8,554	15.9	1,675	19.8	23.2
Motor buses.....	442	0.8	136	1.6	36.0
Commercial trucks....	9,333	17.3	853	10.1	10.5
Motor cycles.....	16,592	30.8	965	11.4	7.0
Street railway cars....	3,075	5.7	288	3.4	10.5
Other kinds of vehicles.....			1,470	17.3	.....
Pedestrians.....			1,392	16.4	.....
Total.....	53,896	100.0	8,476	100.0	100.0

buses, but this is only because of temporary shortage of bus equipment. When this condition is remedied by the receipt of new buses on order it is expected that the transfer privilege will be universal.

This universal transfer plan went into effect March 15, 1927. In addition to the 20-pfennig adult rate, the company sells school tickets at half price. These are good for scholars between the ages of six and fourteen. This rate is also available for scholars up to eighteen



Map showing the Stadtbahn, steam railroads and surface lines in the city of Berlin, Germany



Map showing the rapid transit system in the city of Berlin, Germany

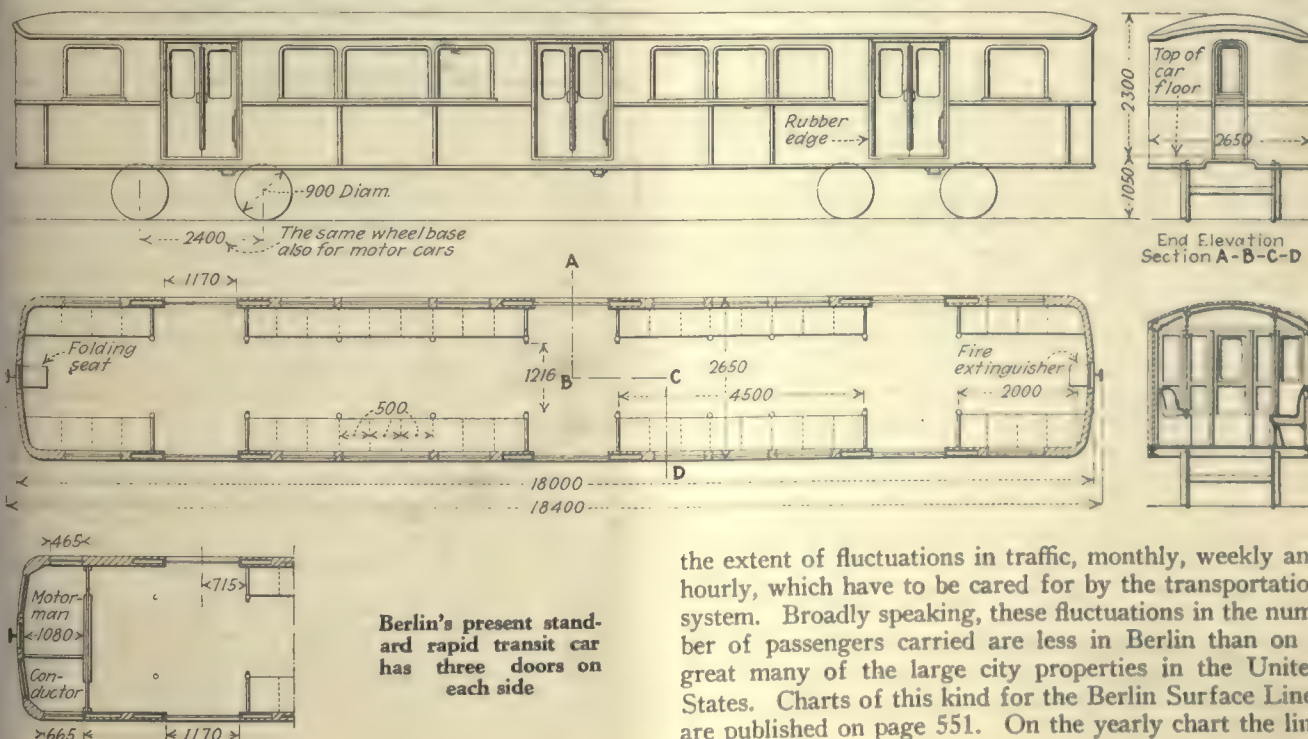
years of age who have secured an official certificate that their financial circumstances call for a reduction in fare. The hours and days on which these school tickets can be used are limited, as in the United States. The reduced rate is also available to crippled war veterans under certain circumstances. Several varieties of monthly passes are also sold by the Berlin Surface Lines and rapid transit system. A purchaser can buy such a pass, good for an unlimited number of rides during the month over one, two, three or all lines of either the surface or rapid transit system, or he can buy one pass good over both the surface and rapid transit lines.

The universal transfer in force is limited to one change and also as to time. The initial trip must be taken within 1½ hours, including the time required to make the transfer. This period was selected after a consideration of the length of trips on individual lines and length of time required for transfer. However, by proper selection of lines a person can take a three-hour trip over a distance

contended with in Berlin are less acute than those encountered in the larger cities of the United States. This is particularly true in the matter of street congestion, which is notably less severe, since with a population of about 4,000,000 there are only about 50,000 registered automobiles and parking regulations are enforced. On the other hand, there are many bicycles and motorcycles, commercial trucks and taxicabs on the public streets.

Table III gives for the city of Berlin the number of street accidents caused by these various types of vehicles during 1926, an accident being so classified when serious enough to become part of the police records. An attempt in this table has also been made to give an idea of the extent of use of the public streets by these various classes of motor vehicles. Obviously, this could not be done by the number of such vehicles registered. Instead, a count was made on Dec. 31, 1926, and the figures in the first column of Table III are based on this count.

Another factor of street railway operating expense is



the extent of fluctuations in traffic, monthly, weekly and hourly, which have to be cared for by the transportation system. Broadly speaking, these fluctuations in the number of passengers carried are less in Berlin than on a great many of the large city properties in the United States. Charts of this kind for the Berlin Surface Lines are published on page 551. On the yearly chart the line

"calculated car-miles" shows an arbitrary figure made up by adding to the motor-car-miles half of the trail-car-miles. This is considered in Europe a very convenient unit for measuring certain expenses, particularly labor expenses. A notable feature of this chart is the comparatively large number of passengers per car-mile, varying from 7.58 to 8.74. Another is the comparative evenness of the load line, though the demand for passenger transportation seems to be slightly greater in summer than in winter. The weekly curve line indicates that Saturday is the big day and Sunday the low day during all periods of the year. The hourly load chart, based on a count of passengers on Wednesday, Dec. 5, shows a good mid-day load, with the rather unusual feature of a broader afternoon peak than morning peak, due probably to the large number of Christmas shoppers. Generally on German street railway lines the morning peak is higher and narrower than that in the afternoon, due to the fact that the opening hours for business in different fields are closer together than the closing hours.

EQUIPMENT OF EXISTING LINES

To care for this traffic the Berlin Surface Lines had, at the beginning of 1927, 1,920 motor passenger cars and 2,008 trail passenger cars, besides 244 service cars, 21 electric locomotives, 206 freight trail cars, 23 postal mail cars and other miscellaneous equipment. To operate its system it had 13,735 employees. Its latest type of motor car, using Cardan drive, is shown in the illustration on page 549 of this article. Full particulars of this and other types of the company's cars were given in two articles by Manager Pforr of the Berlin Surface Lines, appearing in *ELECTRIC RAILWAY JOURNAL* for Jan. 29 and Feb. 5 of this year.

The rolling stock equipment of the Elevated and Underground Road at the beginning of this year consisted of 427 motor cars and 390 trail cars. It had 50.4 km. (31.5 miles) of route and 127 km. (79.4 miles) of track. It has cars of two widths, because one of the later extensions, the Nordsüd line, was built with wider clearances than the original Hochbahn. Both properties now belong to the same company and all future lines will be built with clearances like the Nordsüd cars. A diagram on page 553 shows a plan and elevation of the trail car which has been adopted for all new equipment. The motor car is just like the trail car except that one end has compartments for the motorman and conductor. All dimensions are given in millimeters.

As will be seen this car has three doors on each side. The trail car has accommodations for 53 seated and 112 standing passengers and weighs empty 29.4 metric tons (64,680 lb.). The motor car has accommodations for 44 seated and 117 standing passengers and weighs, with equipment but without passengers, 40.6 metric tons (89,320 lb.). No ventilators are shown on the accompanying elevations, but the Flettner type will be used on all new cars. The older cars have low monitors. Other particulars of the equipment will be contained in a later article by the writer in *ELECTRIC RAILWAY JOURNAL*.

About one-fourth of the cars in each train are smokers and are painted red on the outside so as to be easily distinguishable by waiting passengers. The non-smokers have yellow as an outside body color. Divisions as to classes by fare have been given up within the last year and only one class of fare is now charged.

Before the war the underground conduit system was used by the surface cars in the center of Berlin. All

cars were fitted with trolley poles, and those cars which passed through the center of the city had to have plow equipment also. During the war the company received permission to equip these sections with overhead wires as an emergency measure to reduce maintenance costs. After the war the overhead wires were allowed to remain. There is now no underground conduit operation in Berlin.

The standard train on the Nordsüd line has four cars, of which the two end cars are motor cars and the other two are trailers. This train is increased to one of six cars by the addition at one end of a motor car and trailer.

The cars on the Hochbahn proper are considerably smaller, on account of smaller clearances. They measure only 12.83 m. (42 ft. 1½ in.) long and 2.26 m. (7 ft. 5 in.) wide. The motor car accommodates 26 seated and 56 standing passengers and the trail car 33 seated and 55 standing passengers. Both have two doors on each side. The longest train which can be run on the Hochbahn at present consists of six cars, three motor cars and three trailers, but when the few remaining platforms are extended it will be possible to run trains of eight cars each.

The bus system in Berlin is operated by the Allgemeine Berliner Omnibus A. G., which on the first of this year had 490 buses, with 100 more on order. By far the greater number are double-deckers with solid tires.

Kansas City Company Tells New Car Story in New Way



IN ORDER to acquaint the public of Kansas City with its \$1,500,000 remodeling and rehabilitating car program and at the same time to present graphically the improvements the Kansas City Public Service Company is using the advertising columns of the daily press, employing such copy as is shown elsewhere on this page.

Besides graphically pointing out the new features with numbered key paragraphs, the company, in a box in the righthand corner of each advertisement, is announcing this policy:

In line with our policy to give greater Kansas City an unexcelled urban transportation system, we will spend in the next twelve months approximately \$1,500,000 to remodel and rehabilitate all of our 745 cars. These cars, to be turned out at the rate of twelve each week, will be equipped with all of the recently invented labor-saving devices, embodying some new features developed in Kansas City.

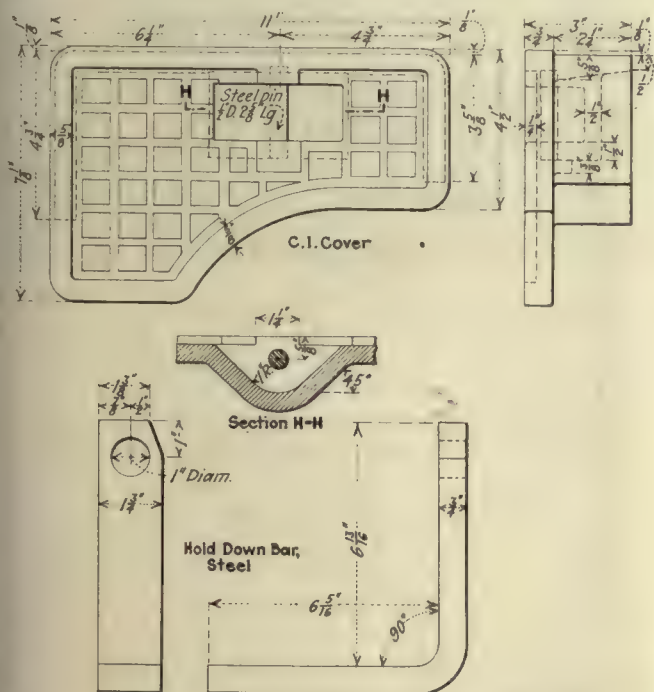
Forty-five of these de luxe cars, the first series to be completed, will be placed in service on the Country Club line early in July. Later they will be rotated on other lines. In addition to the new mechanical and air features, these 45 cars will be equipped with rubber tile flooring Kemi-suede seat covering, new lighting fixtures, sun visors and steel skirts which cover the trucks, minimize the noise and give the car a streamline effect.

Standard Tongue Switch Designed

Study begun in 1924 by committee on way and structures has now been completed. Luncheon conference to be held at convention to discuss proposed design

FOR the past three years the committee on way and structures of the American Electric Railway Engineering Association, acting through a special committee, has been working out a design for a standard tongue switch. This work has now been completed and through the courtesy of one of the manufacturing companies two of the proposed switches will be on exhibition at the Cleveland convention.

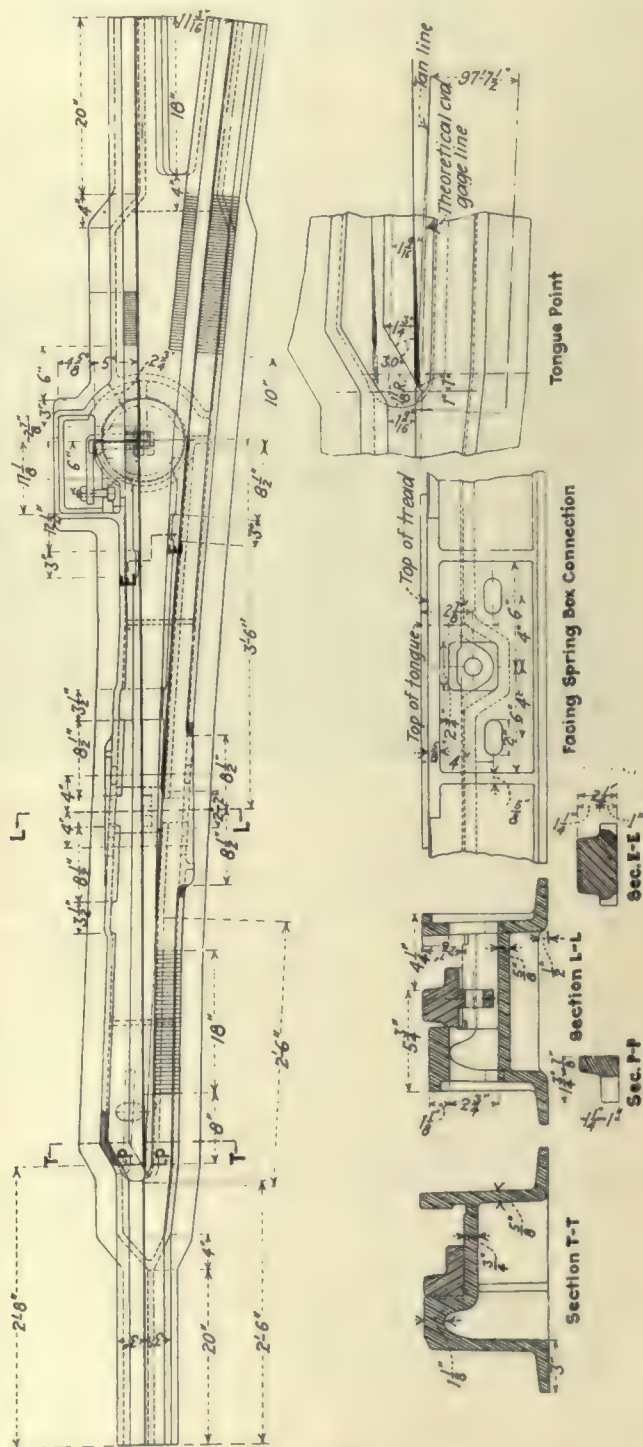
The average street railway has on its lines a great variety of tongue switches, there often being many different styles from a single manufacturer as well as entirely different designs by other manufacturers. The difficulty and expense of maintenance under these conditions is well known to all way engineers. As a result, some of the larger companies have adopted standards of their own, all the way from specifying certain overall lengths to complete designs covering all details. This



Details of tongue pin holding mechanism

has forced special trackwork manufacturers to carry a still greater variety of patterns. The cost of such multiplicity of designs is, of course, necessarily borne by the industry.

In designing a standard tongue switch it was kept in mind that to be satisfactory the switch must be not only as good as or better than existing designs but must be no more expensive. It is felt by the committee that these conditions have been met and it is desired that the new design should be tried out widely so as to demonstrate as quickly as possible whether or not it is satisfactory.



Proposed A.E.R.E.A. standard solid manganese steel tongue switch, 97 ft. 7 1/2 in. radius, showing detail of tongue point, facing spring box connection, and four cross-sections. The type of heel and heel-fastening device is novel in several particulars. The pin is of the tadpole type of 9 1/2 in. diameter and is carried down to a bed on the base of the 7-in. casting.

London, Ont., Cars Converted to One-Man Safety Operation

By L. Tait

Manager and Secretary-Treasurer
London Street Railway, London, Ont.



Seven of these one-man safety cars have been turned out of the shops of the London Street Railway, London, Ont., Canada. They were converted from two-man, single-truck units

LAST fall the London Street Railway, operating in London, Ont., Canada, converted one of its two-man, single-truck cars to the safety type, with double doors in front and a treadle exit door in the rear. This work was in the nature of an experiment because the company's plan to convert fifteen of its two-man cars was not considered favorably by the City Council and it was therefore necessary to demonstrate that this equipment could be satisfactorily converted into up-to-date safety cars. Careful plans were laid to embody in the design all the requirements of an adequate safety car. Although some changes have been made from the first car converted, these have largely been in the nature of additional improvements, the most important being the installation of a unique back-up arrangement placed on the car for the purpose of turning it around "Y's" and so for backing out of the carhouses. The company's equipment all has single-end control and many of the lines have "Y's" at terminals. Because of increasing traffic and the use of a "Y" located on Dundas Street East, which is the main provincial highway through Canada between Detroit and Buffalo, it became increasingly necessary to devise some plan to back up safety cars in order that this equipment could be operated in safety around these "Y's" and without delay to traffic.

Many schemes were considered by the staff, including one to have the operator remove the controller and air brake handle from the front and carry them to the rear of the car. This was discarded on account of the work entailed in removing the handles. Likewise a plan to place the air line at the rear of the car with a small removable air brake handle was vetoed because it was felt that failure of an operator to remove the air brake handle after backing might result in operating troubles.

It was finally decided to use an ordinary hand brake at the rear, and the National Brake Company's Peacock staffless brake was selected and placed between the back cross seat and the small seat on the side of the car. In this way no seating space has been lost on account of the installation of the hand brake.

Directly above the hand brake on the side of the car a circuit breaker was installed, so that this apparatus can be operated with the left hand and the hand brake with the right. Wiring between the front of car and the rear circuit breaker is carried through the roof and along top of car. A heavy type knife switch mounted on a slate base and inclosed in a wooden box with only sufficient space for the travel of the handle is placed on the side of car to the left of the controller. This switch is connected at the top terminal to the front circuit breaker and at the bottom terminal of the switch to the

controller. The bottom terminal of this cut-out switch also has a wire connection through a conduit up the left front vestibule post, the wire running through the roof of the car and along the top to the circuit breaker at the rear. Final connection is then made between front and rear circuit breakers.

Operation of this device, which was described in the Maintenance Data Sheet Section of the JOURNAL, issue of Aug. 20, page 319, is as follows:

The operator opens the knife switch, which cuts the line between front circuit breaker and the controller. He

Reconstruction of the company's London West line of 1.1 miles was begun in August and the company has secured authority from the City Council to install a "Y" at the end of this line in a new location. One leg of the "Y" will be placed on a 40-ft. lot acquired for this purpose. But for this back-up device the company would have been faced with a difficult task, as suitable property was available in that locality for installation of a loop.

As far as general car rebuilding plans are concerned, a definite program has been followed for converting



View of rear platform of converted units, showing, at right, wheel which controls special back-up device



Motorman's position in new safety cars. Here may be studied with the aid of the text, the mechanism which controls the back-up device specially constructed for "Y" operation

then places the controller handle on the first position and hooks down the dead man controller handle with a special hook. This hook is so designed that it can be used only on the first notch. The controller is placed in reverse and the air brake released to the brake-off position. The operator then walks to the rear of the car and immediately operates the circuit breaker to close the circuit, using the hand brake to stop the car. The current flows from the trolley through the front circuit breaker, then through the rear circuit breaker and direct to the bottom connection of the knife switch, on to the controller set on the first position. After backing the car, the operator then proceeds to the front vestibule, removes the hook from the controller handle, adjusts the reverse controller lever and throws in the knife switch. The car is then ready to move forward.

This back-up device has now been in operation for six months and is proving entirely satisfactory, giving one-man operators a clear view of the roadway when backing the car. Previously, operators were having considerable difficulty in backing their cars in traffic, particularly backing up in winter with frosted windows.

the two-man cars with safety equipment. This consisted of completely stripping the cars and removing all thoroughly overhauling each truck, after which reinstallation proceeds along these lines: Each unit is equipped with Canadian Westinghouse air brakes and safety devices and National Pneumatic door equipment, the latter consisting of two door engines for operating the entrance and exit doors at the front and treadle door equipped at the rear. The treadle door engine and its equipment have been placed in a well between the new floor of the car and the old floor of the drop platform at the rear. Installed directly opposite the treadle step and under a small seat placed lengthwise of the car, the well at first was fitted with a trapdoor which completely covered the treadle door engine and its equipment. Some difficulty, however, was experienced last winter in operating the treadle door engine during the very cold snaps, and the difficulty was overcome by boxing in the seat immediately over the well, cutting off half the trap cover and lowering the electric heater under this seat so that the well area could be heated during the winter.

Every car is equipped with two Hunter route pro-

placed one in front and one over the first right-hand window. To distinguish safety cars operating at night from two-man rear-entrance cars, the boxes containing the route signs are made large enough to install a "Front Entrance" sign immediately below them. By this arrangement the two lamps used for the Hunter sign are made to serve a double purpose.

In addition, the units are equipped throughout with aluminum hand railing and stanchions. A mirror has been placed just above the front Hunter sign box so that the operator may see the treadle step and door when the curtains are drawn. All lamps in the front vestibule are fitted with shades and two heavy curtains shield the operator. These curtains slide on rings on rods, bent to proper position. One curtain is immediately back of the operator and the other extends from the front right-hand corner post to the fare box. Curtains at night shut out all reflection from the rear, but allow sufficient opening so the operator has a clear view to the right to observe passengers boarding and leaving car and for fare collection.

Consolidated car heaters with thermostatic control are being placed in each car. All wiring is alongside the cross seats on the right-hand side of the car and is carried in conduit. Air pipes are carried in racks, one pipe above the other on the left side of the car under the longitudinal seat which extends from the front to the rear bulkhead. In front the vestibule air pipes are racked on the side of the car just above the two front door engines. Special seats cover the door engines, these seats being closed in to the floor and provided with a removable face board so that the door engines may be adjusted. All air pipe lines in the vestibule are fitted with unions as well as the air pipe lines immediately connecting with the air brake valve head. This facilitates removal of the valve head for repairs without the necessity of disturbing other connections. Galvanized pipes are now used on all air lines to overcome scale. With all door engines fully inclosed and all air lines off the floor in racks, no difficulty is experienced in sweeping and cleaning under the seats.

Under the new plan the seating capacity has been increased to 41 passengers, a gain of seven seats over the old style two-man type.

REMODELING OF CARS HAS PLEASED THE PUBLIC

To date seven of the converted cars have been released from the shop, each unit being remodeled for approximately \$2,700. The company recently obtained authority from the City Council to operate ten safety cars of this type in regular service. Incidentally, five small safety cars with no rear exit door, operated since 1922, had caused considerable unfavorable comment from time to time when safety car operation was under discussion. The converted car, however, is proving quite satisfactory to the public and many favorable comments are now being received by the management.

Full credit should be given to R. H. Welburn, formerly master mechanic, who is now acting in the capacity of consulting engineer, for the simplicity of the back-up device placed on this car and for many of the details for the conversion of the equipment. Although Mr. Welburn has been in the service of the railway since 1895, a period of 32 years, and recently celebrated his 80th birthday, he is still as actively interested in the equipment of the railway as any of the younger men in the organization.

Readers' Forum

Calculating Rail Tonnage

UPPER DARBY, PA., Sept. 17, 1927.

To the Editor:

Reading the article by Edward A. Roberts in *ELECTRIC RAILWAY JOURNAL* of Sept. 10, setting forth a simplified method of calculating the amount of rail in a given length of track, called to mind the following formula:

Tons rail per mile track = weight rail per yard
multiplied by 11 and divided by 7.

This can be readily verified by arithmetic. It is set forth on page 817-b of the 1911 edition of Trautwine and I would not be surprised if it were given in the first edition. Such a formula is easily memorized (just think of the galloping dominoes) and from it a table of quantities for various rail weights and lengths of track can be compiled.

L. E. SUMMERS.

GENERAL ENGINEERING AND MANAGEMENT CORPORATION

NEW YORK CITY, Sept. 17, 1927.

To the Editor:

I note Mr. Roberts' method of calculating rail tonnages on page 426 of the Sept. 10 issue of the *JOURNAL*. As most of the problems involving rail tonnages in the street railway field are calculated in feet and not in miles, I developed a simple formula of calculating rail tonnages when track measurements are in feet, as follows:

Number of lineal feet of track multiplied by
weight of rail per yard, divided by 3,360.

This formula is correct for all weights of rail. While it may not be original with me, I have never seen it in print before.

Mr. Roberts' formula is, of course, built up on the familiar fact that 1 mile of 70-lb. rail weighs 110 long tons, by which, of course, rail is always bought. His formula is comparatively simple when rail weights are in even tens, but as a great deal of street railway track is built of rail with odd weights per yard there would be some difficulty in applying Mr. Roberts' rule.

C. G. KEEN,
Railway Engineer.

PHILADELPHIA, PA., Sept. 12, 1927.

To the Editor:

In your issue of Sept. 10 is mentioned a rather longer method of applying a simple old formula which has been used in the rail trade for well over half a century. There are 1,760 yards per mile, so that for 2 miles it would take 3,520 yards of rail. There are 2,240 lb. in a ton, and 3,520 divided by 2,240 equals 11/7. There is therefore required per mile of road 11/7 of 1 ton of rail of 1 lb. per yard. Multiply 11/7 by pounds per mile and number of miles of single track to be equipped and you have the total number of tons of 2,240 lb. each of rails required. This formula of 11/7 multiplied by miles and pounds per yard is, I think, the simplest formula obtainable, though it can be shortened where the number of pounds or the number of miles is divisible by 7. For instance, if pounds per yard is 63, one would simply multiply 11 by 9, getting 99 tons per mile.

FRANCIS RALSTON WELSH.

Maintenance Methods and Devices

Body Painting by the Flow Method

PAINTING bus bodies by the flow method, which is considered much more rapid than by the spray method, has been adopted in the Chiswick shops of the London General Omnibus Company. Briefly, the paint is allowed to run from a nozzle over the sides of the bus body in a broad thin stream. One coat by this method is considered equivalent to two by the brush method. It is used only for the final coat, the priming coat being put on by hand, and only about one minute is required by the flow method to paint one side of the body up to the waistline. The roof and top deck are painted by a spray gun and the interior of the lower deck (and of the upper deck in the case of covered top buses), the side posts and



Watering can for painting side sills

Keep your bearings from burning, while the car wheels are turning, by modern and improved lubrication learning.

certain other parts of the exterior are painted by hand.

When the flow method is used the paint may be put on in either of two ways, as shown by the accompanying illustrations. In one, the paint is con-

tained in an overhead reservoir and flows by gravity through a flexible hose through a nozzle to the bus body. With the other method the paint is put on by a can which holds about 1½ gal. and looks very much like an ordinary watering can but has the same kind of a flat nozzle as that used when the paint flows through a hose. In both cases a V-shaped trough is used to catch the surplus paint which drops off the side of the bus.

When to Discard Wire Rope

JUST when to discard wire rope as worn out is a problem which depends on the local application of the rope and the degree of maintenance attention accorded during its period of service. Metallic area apparently unharmed cannot alone be taken as a criterion, since two ropes from the same reel, showing the same degree of wear and number of broken wires, may show under test a variation of 25 per cent in reserve strength.

There are several reasons for this variation, the principal one of which may be that one rope may have been subjected to excessive acceleration stresses which greatly fatigued the steel and caused considerable loss of strength, whereas the other rope may have operated under a more uniform tension and was never overstressed. Another factor might be the presence

or absence of proper lubrication, which, of course, would affect greatly the degree of corrosion.

Wire ropes for shop cranes, electric or pneumatic hoists should be discarded when there are four or more broken wires in any one strand, when the outer wires have been worn to two-thirds of their original diameter; that is, when one-third of the wire diameter is worn off, or when loss of area exceeds 15 per cent for combined wire wear and broken wires.

When inspecting crane and hoist ropes it is always advisable to examine that section of the rope passing over the equalizing or compensating sheaves, as there is a slight movement of rope over these sheaves, causing abrasion or breaking of wires, which at times may prove dangerous.

When employed in the work of hoisting elevators or skips the wire rope should be discarded when there are more than three adjacent wires broken in any one strand, when the outer wires have become worn to two-thirds their original diameter or when marked corrosion appears.

The United States Bureau of Mines in Technical Paper No. 237 advocates that after shaft ropes have been in service for a period of three years, even if idle, they shall not be used unless tested for ultimate breaking strength. Indeed, any rope that has remained idle for some time should be submitted to the test of cutting off and examining the interior wires for possible corrosion and wear. The factor of safety on a deteriorated rope in this class of service should be 4 as minimum.

For boom topping lift, fall or hoist-



Bus bodies up to the waistline are painted by the flow method in the shops of the London General Omnibus Company. Only about one minute is required to paint each side. Paint is applied through a hose or by a can

ing lines, the rope should be discarded when there are six or more adjacent wires broken in any one strand or when the outer wires have been worn to one-half their original diameter.

Holding, closing and boom lines on locomotive cranes should be discarded in conformity with the rules given for the "derrick ropes," but when examination of ropes is made, attention should be given that part of the rope passing over equalizing sheaves.

In the discarding of wire rope consideration should be made of the type of rope employed. It has been known, for instance, that a length of pre-formed wire rope, discarded as completely worn out, was capable of giving nearly twice the amount of service secured.

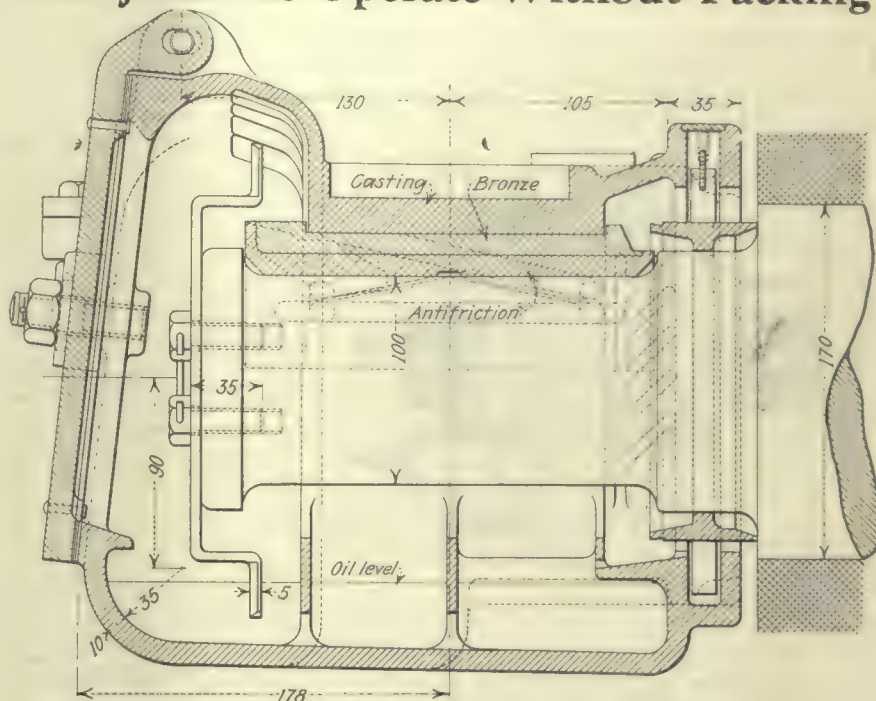
There are many places where life or limb will not be endangered by the breaking of a wire rope, such as car hauls, car transfers, spotters, etc. In such application a wire rope might conceivably be used until an entire strand breaks, but this general rule, of course, has no application to installations that might, in case of emergency, endanger workmen.

Weed Whipper Installed on Snow Sweeper

TO OVERCOME difficulties experienced from weeds growing between tracks, the Southern Ohio Public Service Company, Zanesville, Ohio, has arranged one of its sweepers with a weed whipper attachment. The rattan was removed from the rotary block of one of the brooms and the block was then incased entirely with angle iron bolted securely together. Holes were drilled through the iron to allow steel cables to be

passed through and fastened with clips. When rotated these steel cables grow in the spring are destroyed. During midsummer, when the foliage becomes heavy, the cables have little effect.

Car Journals Operate Without Packing

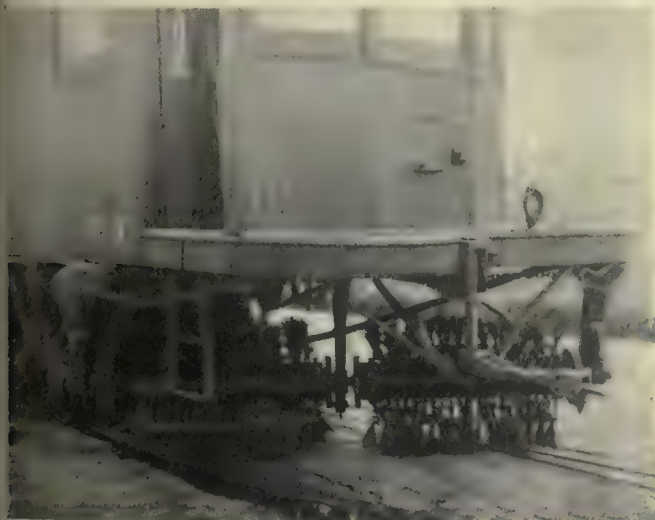


Longitudinal section of car journal, Paris subway car, showing splash plate (dimensions are in millimeters)

AN INGENUOUS method of splash lubrication for car journals is used by the Chemin de fer Metropolitain of Paris, which operates the subway and elevated system in that city. The construction is shown on the accompanying drawing.

The bearings are of anti-friction white metal and a small curved splash plate, 50 mm. (2 in.) wide and 5 mm. ($\frac{1}{8}$ in.) thick, is screwed on to the end of the car journal. The lower end

of this plate dips in a reservoir of oil at the bottom of the housing and as the axle revolves oil is carried over and around the journal. No packing is used. An inspection of the journal is made every four or five days to see whether there is sufficient oil, but usually none is required. The records of the company show that the average consumption of oil per journal box is 16 grams per 1,000 car-km. (5.64 lb. per 100,000 car-miles) run.

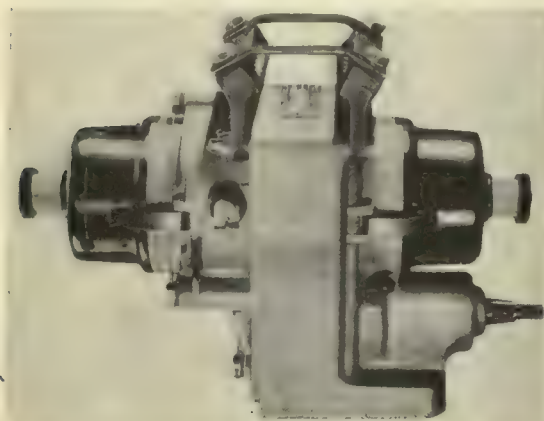


At left, weed whipper attachment in lowered position; at right, raised position of weed whipper

New Equipment Available

Heavy-Duty Ignition of Dual Type

DESIGNED especially for bus and truck use the North East Electric Company, Rochester, N. Y., has brought out a heavy-duty ignition



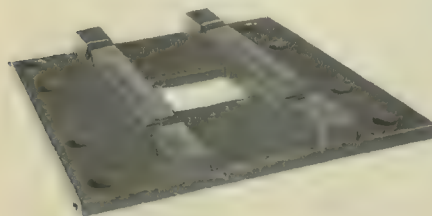
Dual type ignition unit

unit of the dual type. It is used with two distributors and two coils furnishing two sparks to each cylinder. The unit has semi-automatic spark advance, uses four ball bearings and is built for magneto base mounting.

New Joint and Tie Plates of Hamburg Elevated Railway

NEW types of joint plates and tie plates manufactured by the Klöckner Works of Osnabruck have recently been adopted as standard by the Hamburg Elevated Railway of Hamburg, Germany. The two principal features of these plates are heavy ribs on the plates to hold the rail in place and a method of attaching the rail to the plate independent of the attachment of the plate to the tie. Among the advantages claimed for this plate are the following:

The strains from any movement of



This joint plate rests on two ties

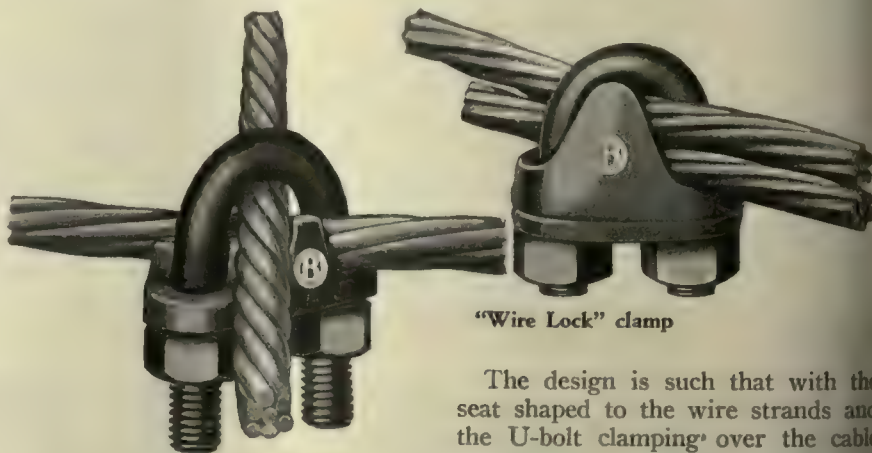
the rails do not come directly against the screw spikes holding the plate to the tie, hence they do not tend to

work in the hole, become loose and pull out.

It is not necessary to change the screw spikes when a rail is changed.

The base of the plate completely covers the portion of the tie on which it rests, so that water does not get through the ties and start decay. The illustrations show a joint plate which is designed to rest on two adjoining ties. The tie plate is similar in construction to the joint plate except that it is less than half as long and has holes for only two screw spikes on each side. The heavy ribs between which the base of the rail rests are shown clearly in both illustrations.

The illustration above shows the clips for attaching the rail to the plate. Each attachment consists of four parts, as follows: (1) A U-shaped clip spanning the rib, one side resting on the base plate, the other on



"Wire Lock" clamp

the base of the rail; (2) a bolt with a triangular head to fit into the triangular opening in the rib; (3) a nut which holds the rib to the base plate, and (4) a lock washer to hold the nut in place. The grip on the rail is so solid that it is expected longer sections of tracks can be welded when the track is exposed without danger of trouble from expansion and contraction.

An adjunct to the plate not previously mentioned is a thin strip of poplar wood between the base of the rail and the plate. This sheet, which is treated for preservation against



Method of fastening rail to tie plate

rot, is 5 mm. (0.2 in.) thick and is capable of being compressed to 3 mm. (0.12 in.) thick. The edges of this wooden strip, which bear no load, tend to swell and form ridges which prevent the rail still further from shifting in the plate.

Clamps for Two Wires

DESIGNED to hold two parallel or cross wires when making splices deadends, etc., the Ohio Brass Company, Ohio, is offering the "Wire Lock" clamp. The shaped seat or groove of the saddle and the angle at which the U-bolt clamps the strands are said to give great strength and holding power. These features permit the clamp to be installed easily and quickly without damage to the wire strands.

The design is such that with the seat shaped to the wire strands and the U-bolt clamping over the cable at a 45-deg. angle tightening the nuts draws the wires downward against the faces of the upright lugs in the shaped seat at the bottom. This provides both lateral and vertical compression on the wires over the greater part of their circumference.

The clamp is furnished in bronze or forged steel, either of which is recommended by the maker for use by electric railways and in overhead and distribution systems generally, the bronze clamp being particularly recommended on interurban and steam road electrification installations, where bronze or copper stranded cables are used.

American Association News

Car Lighting Demonstration at Convention

OF PRIMARY importance among the factors which contribute to the comfort, convenience and safety of electric railway passengers artificial illumination has been accorded special attention by rolling stock committee No. 4 of the American Electric Railway Engineering Association. Supplementing its 1927 report, the committee has prepared a special lighting exhibit at the convention showing a number of recommended illumination systems. The Cleveland Railway has provided a car for this demonstration and installed the lighting equipment. This consists of four independent lighting systems, on separately controlled circuits. The car has a seating capacity of 55 with transverse seats at the rear and longitudinal seats at the front. These two arrangements of seats provide interesting comparisons of the amounts of light available from the various systems of illumination. The arch-shaped headlighting is finished in a light color which gives the greatest efficiency in the utilization of natural and artificial light. System No. 1 consists of five 12-in.

ceiling type inclosing hemisphere fixtures (two qualities of glassware), each containing lamps that may be changed at will, but ordinarily totaling approximately 200 watts. The inclosing bowls are spaced at 8-ft. intervals on the longitudinal center line of the car. Pressed glass deep bowls and blown glass shallow bowls of the diffusing type will be used with this installation.

System No. 2 is composed of ten pendent type fixtures equipped with medium density deep bowl open glass reflectors and 56-watt, 115-volt, S-21 clear-bulb Mazda street railway lamps. The units are spaced at 4-ft. intervals on the longitudinal center line of the car.

System No. 3 has twenty pendent type fixtures equipped with open diffusing glass deep bowl reflectors and 36-watt, 115-volt, S-19 clear-bulb Mazda street railway lamps. These units are arranged ten in a row, one row on each side of the car over the seats on 4-ft. longitudinal centers. Both medium and light density glass reflectors will be shown with this installation.

System No. 4 employs 25 bare 36-watt, 115-volt A-19 inside-frosted bulb Mazda street railway lamps. They are

Many Special Acts Scheduled for Theater Party

CHOICE seats are still available for the theater party to be held at Keith's Palace Theater, Euclid Avenue, Cleveland, for Wednesday evening, Oct. 5, as one of the entertainment features of the convention. In order to avoid confusion in obtaining tickets after delegates reach the convention, they are urged to purchase them in advance. They may be obtained from T. L. Kennedy, vice-president Ohio Public Service Company, Box 693, Cleveland, Ohio. The committee in charge of the theater party has obtained many special acts and a special de luxe performance is assured.

mounted in two rows of twelve on each side, above the seats, with the remaining lamp placed in the center at the rear end of the car.

A summary of the average light intensities obtained on the horizontal and 45-deg. planes for transverse and longitudinal seats with each system of lightings is given in the table.

For convenience in reading fine print, such as newspapers and magazines, the committee has recommended a minimum light intensity of six foot-candles on the reading plane. This is defined as the 45-deg. plane at the normal sitting position at a point 33 in. above the car floor. Each of the four installations described will provide an average of six foot-candles or more on the reading plane at the transverse seats when lamps are operated at average rated voltage.

The fixtures and glassware were loaned by the Adams & Westlake Company, the Electric Service Supplies Company and the Macbeth-Evans Glass Company. The lamps were furnished by Mazda lamp manufacturers.

A cordial invitation is extended to all visitors at the convention to inspect this exhibit. The car will be open for inspection at all times and committee members or their representatives will be in attendance to demonstrate the various installations.

Metropolitan Section Breakfast at Cleveland

DEFINITE arrangements have been completed for a Metropolitan Section breakfast during the Cleveland convention. This will be held on Wednesday morning, Oct. 5, at 8 o'clock in Parlor D on the second floor of the Hotel Statler. The breakfast will be simply a get-together meeting and all members are earnestly urged to attend.

System No.	Reflector Glassware Density	Total Watts	Average Horizontal Illumination	Foot-Candles 45 Deg. Plane Illumination Transverse Seats	45 Deg. Plane Illumination Longitudinal Seats
	Light	1,000	11.57	9.10	6.63
	Medium	1,000	9.11	7.08	5.29
	Medium	600	9.27	7.27	5.13
	Light	800	8.67	6.30	5.00
	Medium	800	10.13	7.93	6.67
	None	1,000	11.68	9.33	7.00



Interior of Cleveland Railway car equipped with four lighting systems on separately controlled circuits

News of Other Associations

C.E.R.A. Master Mechanics Meet

SOME 75 representatives of the Central Electric Railway Master Mechanics' Association from several Midwestern states gathered in South Bend on Sept. 8 and 9 for a two-day program. Reports from the standardization committee and from the committee of uniform charges were read and other routine business conducted. George R. Green, general superintendent Chicago, South Bend & Northern Indiana Railway and president of the association, presided.

Following the first meeting, luncheon was served in the hotel and the afternoon of the first day was devoted to addresses by D. F. Smith of the General Electric Company, Schenectady, N. Y., who spoke on "Railway Motor Manufacture and Maintenance," and by L. F. Mullen of the Sherwin-Williams Paint Company, Cleveland, Ohio, who spoke on "Insulating Varnishes." Later in the day a tour of inspection of the South Shore shops at South Bend was made.

The program on the second day began early in the morning when the guests were transported on a special train over the South Shore lines to Chicago and return, with a stop at Michigan City for an inspection tour of the shops there.

Specifications for Track Materials

ON SEPT. 9 the twelfth meeting of the A.E.S.C. sectional committee on specifications for materials for use in special trackwork and the design of 7-in. plain girder rails was held at the headquarters of the American Electric Railway Association in New York. The American Electric Railway Association is the sponsor body for these projects.

Present at the meeting were R. C. Cram, vice-chairman; J. E. Davidson representing J. B. Strong, E. B. Entwistle, W. G. Hulbert, E. F. Kennedy, E. P. Roundey, E. M. T. Ryder, and H. H. George, secretary. R. E. Hess, representing the American Society for Testing Materials, and G. C. Hecker, special engineer of the A.E.R.A., also attended. Mr. Cram presided at the meeting.

The work of the committee covering design of 7-in. plain girder rails was completed late in 1925, and the designs were adopted as tentative American standards July 1, 1926. The specifications for special trackwork materials have now taken definite shape as the result of the work of a special committee on form consisting of Messrs. Ryder, Alden and Cram. This committee presented a tentative specification, which was approved at the meeting after thorough discussion. The specifications will be submitted to the entire membership of the committee for formal letter ballot and upon approval will go to the sponsor body for approval and submission to the A.E.S.C.

Work of the committee has been delayed through the deaths of its chairman, Victor Angerer, and of George L. Fowler. R. C. Cram was elected chairman to succeed Mr. Angerer and E. B. Entwistle was elected vice-chairman to succeed Mr. Cram.

COMING MEETINGS OF Electric Railway and Allied Associations

Sept. 26-30 — National Safety Council, annual congress, Hotel Stevens, Chicago, Ill.

Oct. 3-7 — American Electric Railway Association, annual convention, and exhibit, Public Auditorium, Cleveland, Ohio. Exhibits open at noon of Oct. 1.

Oct. 4 — American Automobile Association, Motor Bus Division, Cleveland, Ohio.

Oct. 18-21 — National Association of Railroad and Utilities Commissioners, thirty-ninth annual meeting, Baker Hotel, Dallas, Tex.

Oct. 26-27 — Public Utilities Association of West Virginia, annual convention, Parkersburg, W. Va.

Oct. 26-27 — Society Automotive Engineers, Transportation Section meeting, Hotel Sherman, Chicago, Ill.

British Fares Vary Greatly

ORDINARY fares on British municipal tramways vary per mile from 0.67 cents (in Glasgow) to more than 2 cents on some of the smaller lines, as in Cardiff and Dundee. The average fare varies from 1.86 cents (in Aberdeen) to 3.34 cents in Burnley. The average fare in Glasgow is 2.776 cents and in London 2.9 cents. Only three of the seventeen principal municipal systems sell season tickets. Glasgow, New Castle and Aberdeen are the only systems having adult fares less than 1d. (2 cents), though three others have such a rate for children only.

These figures are given in a paper on "Maximum and Minimum Fares," presented at a meeting of the Municipal Tramways and Transport Association at Cardiff, Sept. 7-9, by Lachlan MacKinnon, general manager of Glasgow Corporation Tramways. In speaking of the Glasgow system he said that the 1d. fare in that city was given up in 1920 but reintroduced July 1, 1927. A 2d. (4-cent) maximum fare is still in force in Glasgow and has helped increase the receipts and reduce bus competition. The speaker believes in the principle that the long-distance passenger should pay a lower rate per mile than the short-distance passenger.

This was the only paper scheduled for the meeting, though there were a

number of conferences. The presiding officer was R. L. Horsfield, general manager Cardiff City Tramways, who referred to the changed name of the association, which is now Municipal Tramways and Transport Association, to recognize the bus service by members. He said that the number of buses so operated has increased from 326 in 1920 to 1910 in 1927. He thought the idea that tramways had become obsolete was disproved by the fact that last year the British tramways carried 4,668,812,206 passengers, an increase of more than 48,000,000 over the previous year.

Utilities Commissioners to Meet at Dallas

DALLAS, Tex., has been selected for the 39th annual convention of the National Association of Railroad and Utilities Commissioners. The meetings will be held at the Hotel Baker on Oct. 18-21.

According to the call for the convention issued by Secretary James B. Walker, one whole session will be devoted to the regulation of motor vehicle carriers. There will be reports from the committee on motor vehicle transportation, Hon. Amos A. Betts chairman, and the committee on motor vehicle legislation, Hon. John E. Benton chairman. There will also be an address by H. S. Ives on insurance.

There will be a round-table discussion of "Holding Companies." In addition the several committees of the association will present reports.

The address of welcome will be delivered by Governor Dan Moody of Texas. Hon. John J. Esch, chairman Interstate Commerce Commission, will deliver an address if possible. Other speakers will be United States Senators Pittman of Nevada and Mayfield of Texas, F. A. Farrar, president Investment Bankers Association; Chief Justice Cretton of the Texas Supreme Court; Senor Alexjandro P. Carillo, Mexican Consul-General at San Antonio; Albert L. Reed, member of the National Industrial Traffic League and Industrial Traffic League of Texas, and Prof. W. M. W. Splawn, president University of Texas.

William A. Prendergast, chairman Public Service Commission of New York, will speak on "Valuation." H. G. Taylor of Nebraska, now with the American Railway Association; Carl D. Jackson, Alexander Forward, M. H. Aylesworth and Hon. Sherman T. Handy also will speak.

Prominent executives of the railroad and public utility organizations on the program will include Gen. W. W. Atterbury, president Pennsylvania Railroad; Walter S. Gifford, president American Telephone & Telegraph Company; Oscar H. Fogg, next president of the American Gas Association; Lucius S. Storrs, managing director American Electric Railway Association; Paul S. Clapp, managing director National Electric Light Association; John S. Wise, Jr., president Pennsylvania Power & Light Company.

News of the Industry

Seattle Continues Discussion

Extension of payment of Municipal Railway purchase bonds before Council—New move in Von Herberg suit

A NEW attempt to secure an extension in the payment period for the \$15,000,000 Seattle Municipal Street Railway purchase bonds has been launched in the City Council of Seattle, Wash., with an apparent intention of removing from the office of Mayor Bertha K. Landes to the Council chamber the seat of negotiations for such an extension.

In a resolution introduced by Councilman A. Lou Cohen, the president of the Council is authorized to appoint a special committee to negotiate with representatives of the Puget Sound Power & Light Company and other bondholders. At present Mayor Landes is negotiating with A. W. Leonard, president of the company, by a tacit understanding of Council members, with the idea that the negotiations would continue, and Council members could participate. Mr. Cohen pointed out that the extension plan, recognized as vital to the successful financing of the railway system, had been hanging fire for five years, but so far without tangible results.

LEGAL DIFFICULTIES RETARD SETTLEMENT

The carrying on of the negotiations with the Puget Sound Company has been complicated by the various legal entanglements in which the municipal railway has been embroiled, including the Von Herberg suit, brought to prevent the railway setting aside any funds from its revenues to pay on the purchase bonds until all salaries and operating costs were paid. Mr. Leonard declared, when the suit was brought, that all negotiations, as far as the company was concerned, would be held in *status quo* pending settlement of the litigation.

Asking for dismissal of the action and assessment of costs against the plaintiffs, Thomas J. L. Kennedy, corporation counsel for Seattle, has filed a motion for leave to file an amended and supplemental answer in the suit of J. G. Von Herberg against the city in the railway litigation. At the same time, the city has set up an affirmative defense and filed a bill of interpleader. This is the first move taken in some time in the litigation which started last February, when Mr. Von Herberg purchased some of the "no-fund" warrants issued in payment of the December wages due the trainmen.

All phases of the cases involving the railway system will be argued before Circuit Judge Frank S. Dietrich when he arrives in Seattle within the next two weeks. Two separate suits are

pending, that of Mr. Von Herberg's to halt payment of funds to the bondholders, and one brought by the Puget Sound Power & Light Company to halt this character of litigation involving the system.

The city charges that Mr. Von Herberg purchased the wage warrants merely to continue the "vexatious litigation against the city of Seattle."

Hearings Begun on Omaha Franchise

The City Council of Omaha, Neb., has begun hearings on the draft prepared by City Attorney Van Dusen of the proposed franchise for the Omaha & Council Bluffs Street Railway. Senator R. B. Howell presented his plan for forcing the company, as the price of getting a new franchise, to agree to sell its Missouri River bridge to the city. Spokesmen for the company say no consideration will be given the proposal. Counsel for the Guaranty Trust Company of New York, trustee for the bondholders, has received no instructions as to the clause contained in the city attorney's draft which makes it a condition of the grant that the trustee shall concede that the present franchise is not perpetual.

New York Plan Expected Soon—Mr. Dahl Ordered to Answer

Samuel Untermyer, special counsel for the New York Transit Commission, has nearly completed his report, which will contain his recommendations for transit readjustment for New York City. It is understood a feature of the plan will include recapture of the B.-M. T. subway system, recapture of the Interborough east side subway in event property of the Interborough and B.-M. T. companies cannot be acquired by purchase, and the combination of these lines with the new city subway system. The plan also will contain recommendation for referendum as to whether the fare shall be increased in case the combined system shows deficit of whether any deficit on 5-cent fare shall be paid by taxpayers. It is expected the plan will be ready before Oct. 1.

In the case of Chairman Dahl of the Brooklyn-Manhattan Transit Corporation, who must answer certain questions by Samuel Untermyer, special counsel to the Transit Commission, Justice Frankenthaler said:

The court will require all questions to be answered which bear on the holdings of B.-M. T. stock in the I. R. T. both at date of refusal to testify and for a period of three months preceding. The price and time of purchase need not be given, but quantities of purchases and sales as well as holdings must be fully and frankly stated.

Emergency Rate Denied

Maryland commission is not satisfied that public interest requires higher temporary rates in Baltimore

THE Maryland Public Service Commission has refused to grant an emergency increase in fares to the United Railways & Electric Company, Baltimore, pending hearing on the company's application for a permanent fare of 10 cents. At the same time the commission dismissed the petition for an emergency increase it set Oct. 26 as the date to start hearing the petition for a permanent 10-cent fare. In denying the emergency increase it was stated that the United had failed to make it appear to the satisfaction of the commission that the public interest required the establishment of substantially increased fares or temporary emergency fares pending the establishment of permanent fares, or that establishment of such temporary emergency fares was necessary for the purpose of providing adequate and efficient service, or for the preservation of property.

The hearing had been conducted several days and was hurried through as soon as possible. Opposition to the temporary increase was led by Thomas J. Tingley, people's counsel, who was assisted by attorneys representing the city and various organizations opposed to the increase. Although the United had requested an increase as an emergency it left the amount of increase to the commission. Charles D. Emons, president of the company, said on the stand, however, that the company thought it should receive a temporary increase to 10 cents pending the hearing to make the 10-cent fare permanent.

The application to be heard in October is for a flat rate of 10 cents, 5-cent or half fare for children between four and twelve years of age, school tickets at 5 cents each and special commutation rates. The present fare is 8 cents, with two tokens for 15 cents.

Bill Drawn to Continue Public Control of Eastern Massachusetts

Extension of the period of public control of the Eastern Massachusetts Street Railway, Boston, Mass., for ten years from the date of the termination of the present period of Jan. 15, 1929, is proposed in a bill drawn for introduction at the coming legislative session. Among the bodies that favor the plan is the Savings Bank Association of Massachusetts. The proposed act contains twelve sections substantially the same in their provisions as those contained in the present act. The whole act is based around the provision in Section 1 to the effect that:

The company may, subject to the pro-

visions of this act, exercise all the powers and privileges of a street railway company organized under the general laws, so far as the same are applicable, and, subject to the approval of the department of public utilities, hereinafter referred to as "the department," any powers or privileges granted by any special acts applicable to the company, until the general court shall otherwise provide, and shall be subject to all the duties, restrictions and liabilities imposed upon street railway companies, except as otherwise provided herein.

Higher Fare in Lorain Expected

Rates of fare on cars of the Lorain Street Railroad, operating in Lorain, Ohio, are to be increased soon to 6 cents, with an extra cent for transfers. No definite date has been set for the new rate to go into effect.

Inability of the company to operate on its present income has forced the increase in rates, according to John W. Heim, superintendent.

On the Alert in Buffalo Against Accidents

Co-operating with a local newspaper in a campaign to reduce traffic accidents, Bernard J. Yungbluth, president of the International Railway and the International Bus Corporation, Buffalo, N. Y., has issued a general order to all trainmen and bus drivers to continue their efforts to reduce accidents and promote a greater degree of safety. In his general order President Yungbluth said that if there was any question as to the right-of-way, trainmen and bus drivers should play safe, observe scrupulously the commands of traffic signals, and be particularly careful when children are at play. He recommended a redoubling of efforts to reduce the appalling loss of life occurring through street accidents. "Let us constantly be on the alert," he said, "that the splendid record in safety you have set up may be continually improved."

The president of the traction and bus company said that in spite of the heavy increase in the registration and use of automobiles, the total number of accidents in which the company's cars and buses were concerned was 9.6 per cent less this year than last; 14.2 per cent less than in 1925 and 24.4 per cent less than in 1924.

Fares Increased in Michigan City

The Chicago, South Bend & Northern Indiana Railway has been authorized by the United States District Court at South Bend, Ind., through R. R. Smith, receiver, to increase the fare on local lines in Michigan City from 5 cents to 7 cents. The application for a higher rate of fare in Michigan City alleged that the company had incurred a deficit last year of \$25,245 in operating its cars in that city. The company operates approximately 90 miles of interurban and city lines in north central Indiana.

Argument Started on Schenectady Fare

The first hearing on the petition of the Schenectady Railway seeking a reasonable rate of fare on the lines in Schenectady, Albany, Rensselaer and Saratoga Counties, N. Y., was held on Sept. 8. Authority is also sought to file schedules authorizing a 10-cent fare and 5-cent school token in Schenectady, with corresponding increase in the various fare zones on its divisions to Albany, Troy and Saratoga Springs. The company proposes to issue commutation tickets or 50 rides at commutation rates.

In answer to the query of Mayor Blessing of Schenectady, on the jurisdiction of the commission to fix fares in Schenectady, as such fares had heretofore been fixed by the Common Council, John E. MacLean, attorney representing the Schenectady Railway, said the question had been decided by the Appellate Division of the Supreme Court in the United Traction Company case that the commission had jurisdiction in such proceedings. Commissioner Pooley advised Corporation Counsel Poersch that the commission would reserve decision on the question raised and permit the railway to present such proof at this time as it were prepared to present.

Daniel Naylon, representing the Schenectady Railway, recited the history of the company and concluded with the statement that its present financial condition was such that a serious crisis confronted it inasmuch as its income was insufficient to go on and perform its duty as a public carrier. Adjournment was taken to permit the representatives of the city to examine the evidence and exhibits presented by the company and for the commission to determine the points raised by the city.

Delos Wilcox to Report for San Francisco

At a recent conference between the public utilities and the finance committees and City Attorney John J. O'Toole, at which Delos F. Wilcox was present, the need of expert advice and information was generally conceded and Mr. Wilcox was designated as the man most familiar with San Francisco's situation, sympathetic with the movement of municipalities in acquiring their own transportation and thoroughly competent to make a comprehensive study.

The survey that Mr. Wilcox will make for the city of San Francisco will deal with the expiration of franchises of the Market Street Railway, the best methods of acquiring the properties and the elimination of duplication of service. Major franchises begin to expire in 1929 and the public utilities and the finance committees are making their recommendation of a survey so that the city may be in a position to act when the franchises run out. Mr. Wilcox is reported to have said:

San Francisco is in a better position to solve her transportation problems than any

other city in the United States that has already a system controlled by private ownership. This is due in part to the fact that the city has the nucleus of a city-wide system and in part because the franchise of the privately operated lines are nearing their end. I am convinced that a consolidation can be effected in a manner satisfactory to the public.

Mr. Wilcox estimated the survey would require about two months and set his price at \$5,000 a month. He is prepared to undertake the work at once.

The recommendation to the Supervisors will be made by the City Attorney, whose office had for several weeks been investigating the legal phases of the franchise expiration and the city's rights relative to taking them over.

Want Overhead Wires in Columbus Removed

The City Council of Columbus, Ohio, has asked C. C. Slater, general manager of the Columbus Railway, Power & Light Company, to explain in writing the cause of delay in starting work of removing poles and overhead wires in North High Street between Fifth and Arcadia Avenues. The company has until April 1, 1928, to complete the work but was ordered to start the program several months ago. A 30-day extension, which expired six weeks ago, was later granted and so far no work has been done.

Economics at Boston

Under the caption "Every Day Economics" the Boston Elevated Railway, Boston, Mass., is running in *Co-operation*, its official publication, short chapters from the new book of J. E. Le Rossignol, called "First Economics." Special arrangements have been made with the publishers, the A. W. Shaw Company, for the reproduction of any or all of this book by the Boston Elevated Railway. In August *Co-operation*, there are excerpts on income, wealth and capital. Here are valuable lessons for the employees in the rudiments of economic management and finance.

Change in Rates on Reading Line

A reduction in the cost of monthly 30 round-trip tickets became effective on the lines of the Reading Transit Company, Reading, Pa., on Sept. 1. The new and old rates follow:

	New Reduced Rate	Old Rate	Saving
2 Zone Books.....	\$6.25	\$7.25	\$1.00
3 Zone Books.....	7.50	9.50	2.00
4 Zone Books.....	8.65	11.35	2.70
5 Zone Books.....	9.65	12.65	3.00
6 Zone Books.....	11.75	15.75	4.00
7 Zone Books.....	12.75	17.50	4.75
8 Zone Books.....	13.80	18.55	4.75

On Sept. 1 the company also resumed the sale of its round-trip excursion tickets between Oley Valley towns and Reading. The round-trip fare to Friedensburg is 45 cents and to Boyertown 90 cents. Each ticket allows a six-day stop over privilege.

Fight in Columbia Gains Many Adherents

The transportation problem in Columbia, S. C., long discussed in the public prints and often in the courts, has come in for attention from three new angles recently—the executive board of the Richland County Federation of Women's Clubs has gone on record as favoring the restoration of railway service in Columbia and the school board of the city of Columbia and the board of trustees of Chicora College (a denominational school located in Columbia) have filed intervention petitions with the state Supreme Court with regard to the action instituted some time ago against the Broad River Power Company to bring about a restoration of railway service.

The club women urge the use of every effort to have the railway service reestablished as they are convinced that it is the safest and most reliable system of transportation.

In its intervention petition the Columbia city school board sets forth that an adequate railway system is for many reasons the most desirable form of transportation service for Columbia and its environs, and particularly for this petitioner's purpose for furnishing a safe and reliable means of transporting the school children; further, that the school problem in the city of Columbia is now tremendously increased and rendered more difficult by the lack of an adequate or satisfactory transportation system. The petition from the Chicora College trustees sets forth that the "students and faculty are largely dependent upon an adequate system of public transportation for its best service to the state and community."

This case will likely come up for hearing before the State Supreme Court in October. Several weeks ago the Attorney-General of the state instituted suit for a writ of mandamus requiring the Columbia Railway, Gas & Electric Company to resume the operation of street cars, discontinued last March. The matter has been before the courts for some time. At present, buses are in operation in Columbia and also 10-cent jitneys, which operate without restrictions at present. The jitney, it is generally believed, had much to do with cutting down the patronage of street cars as the jitney takes its passenger to his door. But the jitney has neither schedule nor route, often goes off the street in disagreeable weather and is a free lance in the transportation business.

Smoking Killed in Atlanta

By a vote of nearly four to one Atlanta, Ga., street-car riders have requested the continuance of the present rule forbidding smoking. Not only were hundreds of individual letters received, but many petitions as well, some signed by as many as 100 riders.

Some of the reasons given why smoking should not be permitted were as follows: The unpleasant and unhealthy

atmosphere in smoke-filled cars during seasons when ventilation was not always possible, danger of fire and difficulty for railways to preserve their reputation for cleanliness. Finally, it was generally agreed that any normal man could refrain from smoking for the short period of time he was on a street car and that any gentleman would be glad to do this rather than cause discomfort to his fellow-passengers. The vote against allowing smoking in the cars was so definite that the rule prohibiting smoking will be kept in force.

Inquiry Started on Philadelphia Suburban Rates

Increased rates, effective July 20 on the lines of the Philadelphia & West Chester Traction Company, Upper Darby, Pa., were called for inquiry before James S. Benn, Public Service Commissioner, at a hearing in City Hall on Sept. 15. Protests had been filed by many organizations.

In a statement read by A. Merritt Taylor, president of the company, it was set forth that the investment was \$5,466,725, with the company entitled to a return of 7 per cent. This, he said, in view of a decrease in return of 3.49 per cent in the year ended Aug. 26, compared with the previous year, necessitated an advance in fares to keep the company out of bankruptcy. The hearing was continued.

The schedule of fares, which was published in the *ELECTRIC RAILWAY JOURNAL*, issue of July 2, page 33, called for a flat 10-cent rate where formerly the zone rate was 8 cents.

State Department Overrules Boston Transit Commission

In a case involving the construction of a section of the Dorchester rapid transit system the Massachusetts State Department of Public Utilities has overruled the Boston Transit Commission. The Transit Commission opened bids last August for the construction of Section 4, but decided to reject all the bids on the ground that the time wanted to build the section seemed to the commission "unreasonable, excessive and impracticable because of reasons special and peculiar to the work." The lowest bidder wanted 300 days and the commission was of the opinion that it should be done in 200 days. Hence the commission requested the Public Utilities Department to authorize the rejection of all the bids. In its decision the Department of Public Utilities says:

At the hearing the chief engineer of the Transit Department testified that, in his opinion, the time reasonably required for the completion of Section 4 of the Dorchester Rapid Transit Extension was not more than 200 days, and it was contended that the necessities of the public for the improved transportation contemplated by the act required the completion of the work as soon as it was reasonably possible to do it, and that to take 300 days to complete the work of Section 4 was not in

the interest of the public and that, consequently, there were reasons, special and peculiar, which made it impracticable to proceed under any of the proposals submitted, and thus a rejection of all the bids was justified, under the provisions of Section 15 of said Chapter 480, in order that arrangements might be made by which the work included in Section 4 would be completed within 200 days. The Transit Department did not include this 200-day limit in its proposals.

The statute obviously contemplates that where practicable proposals for contracts shall be advertised and open to competitive bidding and the contract made with the lowest responsible and eligible bidder. We feel that we ought not to authorize a departure from the general plan contemplated by the Legislature unless it is clear that the public will derive substantial benefits thereby. While we are satisfied that the Transit Department has acted in good faith, a majority of us are not convinced that such substantial benefits will be derived from the rejection of the bids as to warrant our authorizing such action.

Accordingly, it is ordered that the petition be and hereby is dismissed.

Commissioner Goldberg dissents.

More Dissension Over Holyoke Fares

A special committee of Aldermen has been appointed by the City of Chicopee, Mass., to investigate and hand down its finding on the proposed increase in rates by the Holyoke Street Railway, Holyoke, Mass., in so far as those increases affect patrons from Chicopee. The committee is anxious to seek a further postponement on hearings regarding these fare changes, which were scheduled to go into effect Oct. 1. The Holyoke Street Railway has stated that increased rates in Chicopee, were essential to the continuation of service on that line. Mayor Michael I. Shea is opposed to the rate increases. The main objection to the rate changes is based on alleged discriminations. According to reports the objection lies in the fact that citizens of Chicopee will be forced to pay a fare increase of 10 cents, whereas citizens in certain sections of Holyoke will pay less.

Another "Coming Out" of Guide Book

The third edition of Guide and Information, published by the Boston Elevated Railway, Boston, Mass., and distributed to tourists and others desiring information regarding the railway, has just come off the press 50,000 strong. The folder is being furnished to all employees.

Compared with the second edition, issued late in 1926 and comprising 100,000 copies, the third edition is designed to stimulate riding as well as to furnish specific information desired by users of the service. It has been made smaller than the second with the idea of bringing out future editions at more frequent intervals. On the large colored map, the central feature in the folder, revision on route changes have been included.

Special Sunday Trips Out of Reading

The Reading Transit Company, Reading, Pa., started on Sept. 18, and continuing each Sunday thereafter for a 30-day trial period, a one-day excursion trip from Reading to Lancaster and return for \$1.25. The route from Reading to Lancaster passes through some picturesque sections of Berks and Lancaster counties. The first car for Lancaster leaves Reading at 4.30 a.m. and every hour thereafter. Returning, the last car for Reading leaves Lancaster at 10 p.m.

Tickets are for sale only at the cashier's office, 412 Washington Street. They cannot be purchased from the conductors.

West Penn Dedicates Lake to Public Uses

Before an assembly of notables, including Gov. Howard M. Gore of West Virginia and his staff, industrialists, bankers, power officials and engineers, the West Penn Electric Company, a subsidiary of the American Water Works & Electric Company, dedicated to the public use on Sept. 14 Lake Lynn, a recreational development. Railway subsidiaries of the American Water Works & Electric Company include the Monongahela West Penn Public Service Company, Fairmont, W. Va., and the West Penn Railways, Pittsburgh, Pa.

Lake Lynn was created by the Cheat Haven hydro-electric development of the West Penn System on the Cheat River in West Virginia, 80 miles south of Pittsburgh. It stretches 13 miles through the West Virginia hills. It was named in honor of the late Albert M. Lynn, former president of the West Penn properties, during whose administration the Cheat Haven project was developed and put into service. A memorial to Mr. Lynn was unveiled during the ceremonies.

Lake Lynn will perform a dual service for people in this region. It will not only furnish an ideal place for recreation, as there are no lakes of any considerable size in this territory, but also the 52,000-kw. power plant located there will provide additional energy to meet the demands of the expanding industries along the Monongahela and Cheat River Valleys.

Teaching "Safety" in Indiana

"Safety Always" was the slogan of a car of the Interstate Public Service Company which visited Scottsburg, Ind., on Sept. 21 and was viewed by many people. The car bore signs and posters urging safety at all times and was thoroughly equipped to convey lessons in safety to all who visited the exhibit. Instructions in the Schaefer prone pressure method of resuscitation were given during the exhibit by an employee of the Interstate in charge of the safety car.

Many school children at Scottsburg and other towns along the route visited the "exhibit" car. Stops were made at all cities and towns along the line.

Portland Theaters Pay Railway Fares

All inbound street cars and buses of the Portland Electric Power Company, Portland, Ore., were chartered between 6:30 and 7:30 on the night of Aug. 19 by the West Coast Theaters, Inc., in celebration of its fall season opening, known as the "Greater Movie Season." Five of the leading theaters in the city are included in the combine. Conductors on the street cars helped to spread the publicity by saying to each patron who entered the car: "This ride is through the courtesy of the West Coast Theaters, Inc. It is the night of their grand opening."

Price Put on Use of Houston Tracks

An agreement has been reached between the City Council of Houston, Tex., and the electric railway interests by which a franchise will be granted allowing the Houston North Shore Electric Railway, operating an interurban between Houston and Baytown, to pay the Houston Electric Company 18 cents per car-mile for the use of the latter's tracks inside the city limits. The cars of the Houston North Shore Electric Railway will use the tracks of the Houston Electric Company on a number of streets.

Higher Fare Sought in Beacon and Fishkill

The Fishkill Electric Railway filed a petition on Sept. 16 with the Public Service Commission for permission to increase fares on its lines in Beacon and Fishkill and in the surrounding territory to 10 cents with twelve tokens for \$1. With the petition is filed a proposed rate schedule, establishing two zones. Strip tickets of twelve coupons each will be sold for \$1. Commutation tickets good for 54 trips, for use during the calendar month indicated on the ticket, will be sold for \$6. School tickets for those under seventeen years of age and attending school will be sold in strips of ten in Zone 1 and Beacon for 70 cents and in Zone 2 for 50 cents.

The petition alleges that its present fare is insufficient to yield a reasonable compensation for the service rendered, is unjust and unreasonably low, and does not allow a reasonable return on the value of its property used in the public service. It further alleges that the company is unable to meet its assessment of \$40,000 as its proportionate share of the paving cost of Main Street from Beekman to Herbert Street in Beacon, which was authorized at a special election of the voters of Beacon in August, 1927. A public hearing will be held on this petition.

Certain Rate Reductions in Seattle

Reduced rates of fare on rides which involve transfers from one system to the other went into effect on Sept. 16 on the Seattle & Rainier Valley Railway Line and the Seattle Municipal Railway of Seattle, Wash. The Rainier company has formally notified the City Council that it accepted the provisions of a recent ordinance which provided for issuance of transfers on either line to the other on an 8½-cent token. At present transfers are given only on a 10-cent fare. In return for this concession, the City Council has provided by ordinance that the railway be credited with 1½ cents on its delinquent franchise tax for each transfer from its lines accepted by the municipal system. The company is in arrears a total of \$77,135 in its franchise tax.

Plans of the Seattle Municipal Railway to extend its service in the Rainier Valley by operating the Empire Way buses over Renton Avenue from Henderson Street to Ryan Street brought a protest from the Rainier Valley Line, which informed the Council by letter of its intention to extend its Rainier Beach bus route on Renton Avenue.

\$27,765 for Efficiency in Brooklyn

For efficient performance of their duties during the year ended July 31, 1927, 1,026 trainmen of the Brooklyn-Manhattan Transit Corporation, Brooklyn, N. Y., shared in a bonus totaling \$27,765. The awards were based upon the efficiency ratings of each conductor and trainman made at periodic inspections of their work. Individual bonuses ranged in amount from \$50 to \$12.50. Because there were in all more than 200 trainmen whose inspection records gave them 100 per cent efficiency ratings for the year, a total of 233 bonuses of \$50 each were awarded instead of 100 such bonuses specified in the bulletin.

Massachusetts Property Enlarge Service

The Union Street Railway, New Bedford, Mass., has been authorized by the Public Utilities Department to take over some of the service that the New Bedford & Onset Street Railway will discontinue on Sept. 30. It will extend its tracks into Massapoisett and it is authorized to construct, maintain and operate a street railway in New Bedford, Fairhaven, Dartmouth and Westport.

Free Rides in Denver

Howard S. Robertson, president of the Denver Tramway, Denver, Col., permitted all boys and girls under eighteen years of age to ride the cars free, between the hours of 1 and 5 p.m., on Aug. 31, the day that Colonel Lindbergh visited Denver. He said he wanted every child in Denver to see the Colonel.

Recent Bus Developments

Southern Pacific Opens Bus Service

A bus service was to be started on Sept. 20 by the Southern Pacific Railroad in conjunction with its steam and electric lines. This announcement was made by T. B. Wilson, vice-president and general manager of the newly organized Southern Pacific Motor Transport Company, a California corporation, which was granted a permit to operate in Oregon two months ago.

The new service will extend from Portland to Salem, Eugene, Roseburg and Ashland, and from Portland to points in other directions, and will include an interurban run connecting Portland, Lake Oswego and other resorts. About 30 buses will be used at first, with probably 45 in use within a month.

It is stated that plans are complete for replacing railway service in the cities of Salem and Eugene with the new buses. The Southern Pacific Motor Transport Company has acquired the traction lines in these two places.

Detroit Coaches Start Passengers on Air Voyages

The Department of Street Railways, Detroit, Mich., is operating daily its Graham Brothers parlor coach from the Detroit hotels to the Ford Airport, 11½ miles away. At that point passengers board Stout air lines for aerial tours or trips to other cities. Regular two-hour coach service was instituted Sept. 1, with a fare of 25 cents each way.

Acquires Perth Amboy Bus Lines

The Public Service Transportation Company, subsidiary of the Public Service Railway, Newark, N. J., acquired three important bus lines in the vicinity of Perth Amboy. One runs from Perth Amboy to Carteret via Woodbridge, another is the Perth Amboy-Rahway line, and the third is the Fords-Woodbridge-Iselin line. Purchase was made from one corporation and several individuals. Twenty-two permits and 6 buses were involved in the transaction. The purchase price was withheld.

Extension of Bus Route in Rome May Mean Profits

The Public Service Commission recently granted the petition of the New York State Railways for the discontinuance of railway service on North James street, Rome, from Thomas Street to Linden Street, for a period of one year only.

A bus line paralleling this route is operated by the Utica Railway Co-

ordinated Bus Line, Inc., which extends into territory not now served by street cars. The railroad company does not wish to abandon the line and remove the tracks until bus service has proved successful. The city of Rome has consented to discontinuance of street car service and the substitution of bus service for five years.

The evidence showed that the street car line in Rome has been operated at a loss, but the railway believes that by the extension of the bus route and other economies additional revenue will result and prove profitable. Repairs to existing street pavements will be made.

Bus Rehearings in New York State Denied

The New York Public Service Commission denied the petitions of the cities of Albany, Troy and Cohoes on Sept. 12 for a rehearing on the application of the Capitol District Transportation Company, Inc., for increased passenger fares on its bus lines in Cohoes, Troy, Albany, Rensselaer and the town of Guilderland. Insufficient reasons were shown why the rehearing should be held.

Express Bus Service Proposed in Washington

The Washington Rapid Transit Company, Washington, D. C., petitioned the Public Utilities Commission on Sept. 18 for permission to establish new routes for express or limited bus service, which would be in addition to the present local service. The routes over which the limited buses would run, however, are slightly different from the regular routes. The use of two streets is contemplated, the buses using less congested streets, returning from the main trip during rush hours to facilitate rapid movement. At the start approximately six buses will be scheduled in the limited service.

Citizen's Peace Threatens School Attendance in Evanston

Application for a permanent injunction filed on Sept. 11 before Circuit Judge Otto Kerner to restrain the Evanston Railway from operating buses over a certain portion of Grant Street in Evanston, Ill., is seriously threatening attendance at the Evanston Township High School, on the far west side of the city. The school reopened the morning the suit was called for hearing with a heavy enrollment. A majority of the students are dependent upon the railway bus service and Grant Street is the only thoroughfare which reaches the school. A citizen residing on Grant Street obtained a temporary injunction

several weeks ago on the grounds that the passing buses destroy the peace and quiet of his home. Now he is seeking an order permanently to restrain their operation on this street.

Buses on Meriden-Middletown Route

The Connecticut Company has lately decided to change over to bus service on the Meriden-Middletown line, and has petitioned the Public Utilities Commission for such authority. The date for the public hearing has not been specified.

Morris County Planning Change Over

Otto G. Schultz, general manager of the Morris County Traction Company, is on a trip, during which he will meet with the bondholders' committee of the company at Pittsburgh to arrange for the substitution of buses for trolleys. He planned this trip following the favorable decision on Sept. 3 of the Public Utility Commission on the matter of the substitution.

It is expected that buses will be ready to operate within thirty days after the order is placed and this will mean shortly after Oct. 2. While Mr. Schultz desires to secure all new buses of the type now in use and giving satisfactory service on the Springfield-Elizabeth line, it may be that arrangements will be made with the Public Service Corporation for the use of some of its buses. The new buses would cost about \$350,000.

The railway is in the hands of receivers. It is proposed to offer the assets under foreclosure sale in four lots. One will be the right to operate bus lines, another will include the right to operate railway lines and other rights under this franchise, the third lot will comprise the real estate and the fourth will include the personal property and equipment.

In its decision the Public Utility Commission reserved the right to issue an order at some future time concerning the removal of the poles and overhead lines and also the replacement of the pavement when the tracks are taken up. This, Mr. Schultz said, was due to the fact that the company did not ask to abandon these and will not do so until after the bus lines are in routine operation. Then the commission will be requested to grant permission for the removal of these rails. Both buses and cars will be run for a time until the bus routes are thoroughly worked out and the machines running satisfactorily. In the event that the travel by bus proves more popular than by trolley car, the company will be prepared to increase its service.

Just how the change will work out in relation to the direct line running into Newark has not yet been decided. Now the Morris County cars operate over tracks of the Public Service Railway through special arrangement. If

the bus route is substituted there, the buses will be run as an express line direct from the terminal of the Morris County line.

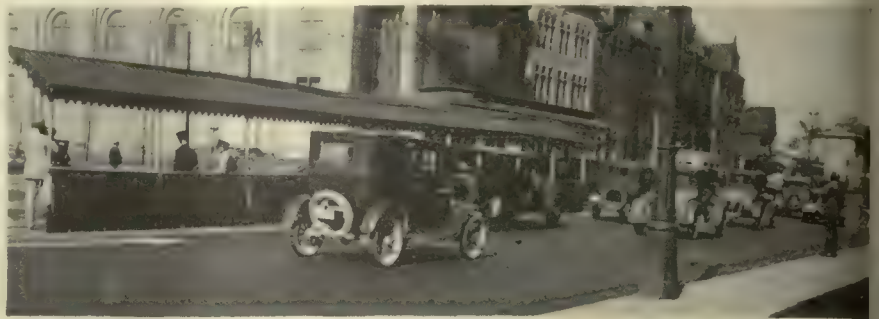
Express Service in Detroit

The plans for express service as worked out by the Department of Street Railways in Detroit and put in operation on Jefferson Avenue on Sunday, Sept. 18, have proved successful after the first few days of operation and, according to General Manager Del A. Smith of the Detroit Municipal Railways, the express system is a distinct improvement over the old system. The cars are run express. Between express stops local buses, known as transfer buses, pick up passengers and deposit them at the nearest express stop. These buses double back between express stops.

At a meeting of the Street Railway Commission after the Jefferson Avenue express service had been started it was announced that a number of other improvements were contemplated. These include the synchronization of traffic lights on Jefferson Avenue, which are now operated manually; facilitation of the movement of cars in the downtown loop, extension of the local bus service to the downtown district and the installation of windows in the loading stations. The commission also authorized the purchase of 50 instruments for buses to record the time of stops, the speed and mileage.

It is anticipated that express service will also be established on Grand River Avenue in the near future. Ultimately, it is planned to extend the service throughout the entire Jefferson line and to run a modified express service even through the downtown loop. The Jefferson line will probably be extended about 2½ miles beyond the city limit into the village of Grosse Pointe.

The Miller-Schorn system is applied experimentally to the Jefferson Avenue line. The total route is 6.8 miles. The express portion from Antoine to Lillibridge, 4.3 miles, is covered at an average speed of 18.4 miles. The maximum running speed is 27 miles. The stations are at intervals of 0.9 miles, located



Sheltered express stations are spaced at 1-mile intervals at Detroit

at Antoine, Chene, Grand Boulevard, Parker, Parkview, Lillibridge. Express zones are equipped with orange and black awnings and splash aprons. In the express section transfer buses pick up passengers at the curb and deliver them to the express zones. The present zones are being used temporarily. Loading stations to be located between tracks with sub-walks are being considered by the city.

A three weeks publicity campaign with posters and newspaper co-operation educated the public for the change. There were three days of preliminary training for motormen, conductors and special guards for express stations. Police traffic officers were supplied for automobile control so as to approximate the condition expected when the cascaded traffic lights and the stations with sub-walks are installed between the tracks.

Traffic Director Gustave C. Schink is enthusiastic over the change. He says auto traffic has been speeded 40 to 60 per cent and the street capacity proportionately increased. Newspapers report the system has public approval.

Mr. Smith states many letters of approval have been received from patrons and only two criticisms from 60,000 daily passengers on the Jefferson line after four days operation. Improvement associations of other Detroit sections are requesting similar service. According to Mr. Smith the soundness of the plan has been definitely established, but it is too early to state the exact operating costs.

Contents Bus Routes in Brooklyn Not Needed

Objections to the granting of a certificate to the Equitable Coach Company by the Board of Estimate to operate buses in Manhattan, Brooklyn and Queens were filed with the Transit Commission on Sept. 21 by Clarence J. Shearn of counsel for the Brooklyn-Manhattan Transit Corporation and the Brooklyn City Railroad, Brooklyn, N. Y. A protest was also made by the New York Railways Corporation through William Wallace of the law firm of Chadbourne, Stanchfield & Levy as counsel. A hearing will be held on Sept. 26.

Mr. Shearn said the Equitable company in its application failed to say anything about its financial condition or how it proposed to finance the operation of its bus routes. He also questioned the necessity for the different bus routes which the board authorized. He added that the Brooklyn-Manhattan Transit Corporation was prepared to meet the contentions to disprove the necessity of the bus routes in Brooklyn.

Bus Replaces Rail Line in Gadsden

Bus service has replaced railway service on the North Fourth Street and Ewing Avenue line in Gadsden, Ala. The Alabama Power Company is operating as an experiment a 25-passenger bus on the short crosstown line.



Buses run local and cars express in new service on Jefferson Avenue, Detroit

Financial and Corporate

Brooklyn Case Appealed

Brooklyn-Manhattan Transit Corporation secures order to require commission to submit records of bond case for review

THE New York Rapid Transit Corporation, a subsidiary of the B.-M. T., obtained on Sept. 21 from Supreme Court Justice Phoenix Ingraham an order in certiorari proceedings requiring the Transit Commission to submit for judicial review all papers and records in connection with the company's application for permission to sell \$20,000,000 in refunding mortgage 5 per cent bonds to pay for new cars and for other purposes. The New York Rapid Transit Corporation proposed to sell these bonds to the B.-M. T. at 80, or for \$16,000,000. The commission on Aug. last denied the application on advice of Samuel Untermyer, its special counsel.

In its petition the New York Rapid Transit Corporation attacks statements made by Mr. Untermyer during the recent transit inquiry hearings and asserts that the commission in denying its application acted merely upon the advice of Mr. Untermyer without requiring proof of his assertions. The decision of the commission, the petition alleges, was erroneous because the commission denied consent to the issuance of the entire amount of the proposed issue of bonds, notwithstanding that Mr. Untermyer had consented to the issue of bonds at the price of 80 up to the amount of \$3,467,000, the amount which the company desired to spend for purposes not covered by its contract with the city.

The commission, the petition charges, confused its functions as a regulatory body under the Public Service Commission act and its functions as an agent of the city under the contract between the city and the company. The commission, the petition continues, has assumed to use its powers as a regulatory body and to give consideration to the alleged effect on the amount the city would be required to pay the petitioner for debt discounts and expenses in case the petitioner should sell the bonds at 80 and the city should exercise its alleged right of recapture of the city-owned rapid transit lines operated by the petitioner.

The right of the city to recapture is questioned in the petition, which states that the city has not given the company the one year's notice required, as a condition precedent to the exercise of its alleged recapture right. The petition contends that the city is not now and will not be in a position to give such a notice or to exercise its alleged recapture rights until it constructs the Nassau Street subway, as provided in the contract.

The city has not indicated that it has any intention or desire to exercise its alleged right of recapture and to separate the city-owned and company-owned

rapid transit lines of the B.-M. T. system and disrupt the service, the petition recites, unless statements of Mr. Untermyer, unsupported by any evidence or proof of his authority to make them, is accepted as an indication of city policy.

The commission erred, the petition recites, in giving consideration to Mr. Untermyer's statement that the petitioner is "a mere creature of the Brooklyn-Manhattan Transit Corporation, which proposes to take these bonds at 80 cents on the dollar." Exception also is taken to the statements attributed to Mr. Untermyer that "the parent company is both the seller and the buyer" and that "the parent company is selling the bonds to itself at a price and upon terms fixed by it."

Would Free Nashua Property from Tax Payments

The Public Service Commission has certified to the State Tax Commission that the Nashua Street Railway, Nashua, N. H., should be exempted from taxation for the year 1927, because the road failed to earn operating expenses through the year closing March 31.

Railway Property Not Included in Transfer

Commissioner Lunn held a hearing on Sept. 13 on the petition of the Eastern New York Utilities Corporation, Rensselaer, N. Y., and the Municipal Gas Company, Albany, for consent to transfer the gas and electric franchises, works and systems of the former to the latter. The petition alleges that this transfer is to be made on the basis of the net book value of the property transferred, plus or minus adjustments, the book value to be determined by the commission. The electric railroad property of the Eastern New York Utilities Corporation is not to be transferred.

Colorado Springs Rejects Railway Offer

After deliberating the matter for some time, the City Council of Colorado Springs, Col., on Sept. 13 answered that the city will not purchase the Colorado Springs & Interurban Railway. Buses have already supplanted some of the car lines in that city.

The railway made it plain to the city officials of Colorado Springs that it could not operate the street cars much longer unless there were more revenue; that regardless of the increased fare it was not making sufficient money to justify the continuance. It then offered the system to the city for \$500,000, agreeing to accept half that amount in city bonds.

Day & Zimmermann Deal Approved

U.G.I. votes additional stock necessary to carry out plan first voted months ago

STOCKHOLDERS of the United Gas Improvement Company at a special meeting on Sept. 15 voted to increase the authorized capital stock of the company from 2,036,528 shares, par \$50, to 2,130,088 shares; the additional shares to be used in the acquisition of the engineering and public utility firm of Day & Zimmermann, Inc., of Philadelphia, and stock of several gas companies operating in Connecticut.

Shareholders of the company also voted to increase the number of directors to twelve, including the president, who is an ex officio member of the board. Three new directors were elected as follows:

Thomas S. Gates, of Drexel & Company and J. P. Morgan & Company; Charles Day, of Day & Zimmermann, Inc., and Morris W. Stroud, president of the American Gas Company.

After approving the increase in capitalization, the stockholders authorized the board of directors to issue 53,082 shares in exchange and payment for 58,980 shares of the no-par common stock of Day & Zimmermann, Inc., 2,017 shares in exchange and payment for a like number of shares of the no-par preferred stock of Day & Zimmermann, payment for 3,656 shares of the common, and 38,461 shares in exchange and mon stock of the Hartford City Light Company and for 204,481 shares of the no-par common stock and 8,361 shares of the no-par preferred stock of the Connecticut Gas & Coke Securities Company.

Directors of the company convened immediately after adjournment of the stockholders' meeting and approved a resolution providing for the exchange of stock, as authorized by the shareholders.

Concerning the exchange of shares as arranged with the Day & Zimmermann concern, a statement issued by the management of the United Gas Improvement Company said:

The exchange of stock with Day & Zimmermann, Inc., will give the U.G.I. a controlling interest in that widely known public-utility company. Day & Zimmermann, Inc., is interested in and operates properties in fifteen States, serving 935 communities with a population of 2,369,000. Among the largest properties controlled and managed by Day & Zimmermann are the National Public Service Corporation, the General Public Utilities Company and the Southern Ohio Public Service Company.

Kansas Road Sold Under Foreclosure

The Kansas City, Kaw Valley & Western Railway, an interurban operating from Kansas City to Lawrence, Kans., was sold to the first mortgage bondholders for \$300,000 at a recent special master's sale. The bid presented

by George W. York, Cleveland, chairman of the first mortgage bondholders' protective committee, included a cash payment of \$50,000 specified in the sale order made by Judge John C. Pollack, in federal court. Mr. York was the only bidder. A valuation of \$1,500,000 had been placed on the line.

The interurban has been in receivership since July, 1924, but continued to operate during that period.

Mr. York said that approval of the sale would be asked of Judge Pollack promptly and a general plan for the reorganization would be announced as soon as the approval was given. The line will continue to operate unchanged until that order has been approved and the reorganization completed.

Talk of Akron-Youngstown Merger

It is stated that a discussion that may lead to a consolidation of the Northern Ohio Power Company and the Penn-Ohio Power system has been resumed. Practical control of the Penn-Ohio system rests with the American Superpower Corporation, through holdings in the Penn-Ohio Securities Corporation. Interests friendly to American Superpower control Northern Ohio. Properties of the companies in the reported merger are adjacent. Northern Ohio serves Akron and vicinity in a radius of 30 miles. Penn-Ohio has headquarters at Youngstown, about 60 miles east of Akron, and sends electricity as far as Pennsylvania. Connections through other lines make a superpower system

extending from Cleveland to Akron and Canton in Ohio, Windsor in West Virginia, Charleroi in Pennsylvania, and back to Youngstown and to Cleveland.

\$900,000 Needed to Complete St. Louis Reorganization

The St. Louis Public Service Company will require at least another \$900,000 in addition to the cash now available to complete the reorganization of the United Railways, St. Louis, Mo. This estimate was made by W. DeW. H. Bradley, secretary of the company, in a letter sent to the Missouri Public Service Commission, which has the reorganization plan under consideration.

The cash requirements of the new company include \$2,000,000 to pay off Suburban bonds, \$2,937,000 for cash settlement with holders of St. Louis Transit Company bonds, \$440,550 for accrued interest and \$1,130,745 for accruing preferred stock dividends, a grand total of \$6,508,295. Cash available will be \$1,040,187 from common stock sold to holders of transit company bonds, \$1,041,720 from common stock sold holders of other securities of old company, \$3,000,000 cash estimated to be sum receiver will turn over to new company and \$276,280 from sundry items, a total of \$5,662,937. The estimate of requirements did not include any of the actual expenses of reorganization. These expenses are expected to exceed \$800,000, while in addition the reorganization committee advanced \$409,754 to the St. Louis Bus Company for 35 buses.

Union Traction Lines Carry 11,800,810 Passengers

The revenue from railway operation for 1926 of the Union Traction Company of Indiana, Anderson, Ind., was \$3,060,465, compared with \$2,939,182 for 1925. Expenses of railway operation were \$2,566,742, compared with \$2,541,873. Gross income for 1926, being the income after operating expenses and taxes, but before charges for bond interest and other fixed charges, was \$408,625, compared with \$324,787. These facts were contained in the annual report of the company, submitted by the receiver to the Madison Circuit Court in Indiana.

In operating expenses for the year are included \$571,623 for maintenance

INCOME ACCOUNT OF THE UNION TRACTION COMPANY FOR THE YEAR 1926

Revenue from transportation:	
Passenger.....	\$2,046,994
Baggage.....	6,285
Parlor, chair and special car.....	10,003
Mail.....	5,565
Express.....	131,502
Milk.....	14,171
Freight and switching.....	696,466
Total.....	\$2,910,990
Revenue from operation other than transportation:	
Station and car privileges.....	\$15,153
Parcel room receipts.....	120
Car service and storage.....	544
Rent of tracks and terminals.....	2,826
Rent of equipment.....	9,589
Rent of buildings and other property.....	13,589
Power.....	107,302
Miscellaneous.....	348
Total.....	\$149,475
Total operating revenue.....	\$3,060,465
Operating expenses:	
Way and structures.....	571,623
Equipment.....	351,599
Power.....	512,676
Conducting transportation.....	737,559
Traffic.....	41,180
General and miscellaneous.....	352,071
Total operating expenses.....	\$2,566,742
Net operating revenue.....	493,723
Taxes.....	110,000
Net operating revenue less taxes.....	\$383,723
Other income.....	24,901
Gross income.....	\$408,624

Conspectus of Indexes for September, 1927

Compiled for Publication in This Paper by
ALBERT S. RICHEY

Electric Railway Engineer, Worcester, Mass.

	Latest	Month Ago	Year Ago	Since War	
				High	Low
Street Railway Fares* 1913 = 4.84	Sept. 1927 7.53	Aug. 1927 7.52	Sept. 1926 7.36	Sept. 1927 7.53	May 1923 6.88
Electric Railway Materials* 1913 = 100	Sept. 1927 141.6	Aug. 1927 142.1	Sept. 1926 151.2	Sept. 1927 247.5	Sept. 1927 141.6
Electric Railway Wages* 1913 = 100	Sept. 1927 227.8	Aug. 1927 227.8	Sept. 1926 226.1	Sept. 1927 232	March 1920 206.8
Am. Elec. Ry. Assn. Construction Cost (Elec. Ry.) 1913 = 100	Sept. 1927 199.4	Aug. 1927 200.9	Sept. 1926 203.2	July 1920 256.4	May 1922 167.4
Eng. News-Record Construction Cost (General) 1913 = 100	Sept. 1927 203.6	Aug. 1927 205.5	Sept. 1926 208.3	June 1920 273.8	March 1922 162.0
U. S. Bur. Lab. Stat. Wholesale Commodities 1913 = 100	Aug. 1927 146.6	July 1927 144.6	Aug. 1926 149.2	May 1920 246.7	Jan. 1922 138.3
Bradstreet Wholesale Commodities 1913 = 9.21	Sept. 1927 12.90	Aug. 1927 12.58	Sept. 1926 12.70	Feb. 1920 20.37	June 1921 10.62
U. S. Bur. Lab. Stat. Retail Food 1913 = 100	Aug. 1927 152.4	July 1927 153.4	Aug. 1926 155.7	July 1920 219.2	March 1922 138.7
Nat. Ind. Conf. Bd. Cost of Living 1914 = 100	Aug. 1927 162.0	July 1927 162.2	Aug. 1926 165.3	July 1920 204.5	Aug. 1922 154.5
Steel Unfilled Orders (Million Tons) 1913 = 5.91	Aug. 31 1927 3.196	July 31 1927 3.142	Aug. 31 1926 3.542	July 31 1920 11.118	May 31 1927 3.051
Bank Clearings Outside N. Y. City (Billions)	Aug. 1927 17.92	July 1927 18.37	Aug. 1926 17.63	Oct. 1925 20.47	Feb. 1921 10.43
Business Failures Number	Aug. 1927 1448	July 1927 1503	Aug. 1926 1512	Jan. 1924 2231	1925 1353
Liabilities (Millions)	Aug. 1927 43.76	July 1927 37.90	Aug. 1926 39.26	1922 122.95	27.22

*The three index numbers marked with an asterisk are computed by Mr. Richey, as follows: Fares index is average street railway fare in all United States cities with a population of 50,000 or over except New York City, and weighted according to population. Street Railway Materials index is relative average price of materials (including fuel) used in street railway operation and maintenance, weighted according to average use of such materials. Wages index is relative average maximum hourly wage of motormen, conductors and operators on 136 of the largest street and interurban railways operated in the United States, weighted according to the number of such men employed on these roads.

TRAFFIC STATISTICS OF THE UNION TRACTION COMPANY (Year ended Dec. 31, 1926)

Passengers carried, interurban lines.....	4,174,308
Passengers carried, city lines.....	7,626,502
Total passengers carried.....	11,800,810
Freight handled, tons.....	268,644
Express handled, tons.....	10,976
Mileage of cars, interurban lines, miles.....	6,745,003
Mileage of cars, city lines, miles.....	1,770,914
Total mileage of cars, miles.....	8,515,917

of way and structures and \$351,560 for maintenance of equipment, making the total sum charged in these directions for maintenance of the property \$923,223. This is equal to 30 per cent of the gross railway operating revenue for the year.

The 1926 account for additions and betterments shows debits of \$139,627 and credits of \$164,687, making the balance for the year a credit of \$25,061. The credits arose principally out of the removal of three railway lines at Muncie and the sale to the Indianapolis Street Railway of part of the Broad Ripple line at Indianapolis. This amount is exclu-

STATEMENT OF EARNINGS OF VARIOUS DIVISIONS
OF UNION TRACTION COMPANY

	Total Operating Revenue	Total Operating Expenses	Taxes	Other Income	Gross Income
Union Traction.....	\$1,423,413	\$1,257,537	\$45,529	\$9,157	\$129,499
Indianapolis Northern.....	784,114	597,881	23,232	11,748	174,748
Muncie, Hartford & Fort Wayne.....	274,211	221,610	10,384	1,196	43,414
Muncie-Portland.....	105,069	84,102	5,951	400	15,416
Indianapolis, New Castle and Eastern.....	308,408	230,856	10,065	1,460	68,948
Muncie-Union City.....	84,976	88,087	8,195	490	*10,814
Marion-Wabash.....	59,414	61,017	4,444	344	*5,703
Anderson-Middletown.....	20,856	25,647	2,200	106	*6,884
Total.....	\$3,060,465	\$2,566,741	\$110,000	\$24,901	\$408,624

*Deficit.

sive of charges in 1926 for the purchase of buses and bus lines, amounting to \$289,602 and also of charges of \$26,029 for extensions of and betterments to the property of the Traction Light & Power Company, wholly owned by the Union Traction Company of Indiana. The principal debt item included in additions and betterments is \$60,000, representing the purchase under a conditional sale contract of twenty freight box cars.

Buses were operated by the receiver during much of 1926 between Indianapolis and Peru, Indianapolis and Muncie, Indianapolis and Sheridan and Anderson and Marion, in the cities of Anderson and Muncie and at Fort Benjamin Harrison. Gross revenues for bus operation were \$129,423 and operating expenses, taxes, interest and amortization charges were \$268,288, making a deficit resulting from bus operation of \$138,865, which includes \$81,495 for depreciation and amortization.

The report mentions the record of the general safety board and department safety organizations in promoting safe and efficient operation, and to the co-operation shown and interest taken by employees generally in the endeavors made during the year to meet the difficult conditions confronting the company.

Operation of the Anderson-Middletown interurban line resulted in a deficit of \$6,884 for the year. This deficit is greater by \$2,628 than that of 1925, as shown in the receiver's report for that year. Operation of the Muncie-Union City line resulted in a deficit of \$10,814, being \$2,896 greater than that shown for 1925. Operation of the Marion-Wabash interurban line resulted in a deficit of \$5,703, which is \$962 less than that shown for 1925. Further consideration is being given to the question of the course which should

be taken with respect to these three interurban lines and certain non-paying street railway lines.

Some facts are also given on the Traction Light & Power Company, the sales of the Broad Ripple lines, the Broad Ripple Traction Company's bonds and the Traction Land Company, a subsidiary of the Union Traction Company of Indiana.

The segregation of earnings and expenses of the respective lines subject to the liens of the principal mortgages and also of the lines leased to the Union Traction Company of Indiana was undertaken, and the earnings and expenses so segregated for the year are shown, tentatively and subject to revision.

Would Abandon Illinois
Interurban

The Illinois Power & Light Corporation has filed a petition to abandon its interurban line between Danville and Catlin, Ill. With suspension of its operation traffic between the two terminals will be handled by the Allerton bus line, which up to this time has been forbidden to handle passenger traffic in the territory. The traction line has been a losing proposition for more than a year.

Local Interests Take Over
Wichita Property

Passage of control of the transportation business in Wichita, Kan., from the Illinois Power & Light Company to a \$3,000,000 Wichita concern is noted in the organization of a new company, details of which were completed on Sept. 14 at a meeting of the Wichita Transportation Company's directors and officers.

The meeting marked completion of negotiations and organization work through which ownership in the Wichita traction systems passes from the Illinois Power & Light Company to a group of Wichita capitalists.

Officers of the company are: H. V. Wheeler, banker, president; R. B. Campbell, president of the Arkansas Valley Interurban Company, vice-president; R. C. Clevenger, banker, secretary-treasurer, and Robert C. Foulston, former city attorney, counselor.

All stock of the new company, formed to operate the transportation facilities of the city, including both bus lines and car lines, is owned by local people in Wichita.

Seeks Receiver for Fitchburg
Road

A bill in equity against the Fitchburg & Leominster Street Railway, Fitchburg, Mass., seeking appointment of a receiver was filed in the Suffolk County Superior Court on Sept. 21 by Charles S. Cummings of Boston, who asks to have the company ordered to pay interest on \$5,000 in bonds he holds and also to have it restrained from payment on unsecured notes until the bonds are paid in full. E. W. Baker, president, looks upon the action as entirely unwarranted and characterizes Mr. Cummings' statements as not being in accordance with the facts of the case.

Auburn Abandonment
Authorized

The Public Service Commission granted on Sept. 15 the petitions of the Auburn & Syracuse Electric Railroad for permission to abandon all of its car lines in the city of Auburn and two lines forming part of its system in the towns of Owasco and Fleming. The abandonment does not affect the interurban lines of the company and these are to be continued in operation. Hearings were held on these applications by Commissioner Lunn in Auburn on Aug. 2 and Aug. 20. In his memorandum accompanying the order he said that the representatives of the city practically conceded that local trolley service could no longer be carried on profitably in Auburn and the Common Council has gone to the extent of soliciting bids for bus service to supplant the trolleys. The order of the commission becomes effective on Oct. 15, 1927.

Binghamton Sale Ordered

The properties of the Binghamton Railway, Binghamton, N. Y., which include a \$1,000,000 electric lighting plant at Endicott, will be sold under mortgage foreclosure to the highest bidder on Dec. 1 next, according to an order issued by Federal Judge Frank Cooper at Elmira.

Bidding must start at \$2,300,000 "upset price," according to the court order. The properties were appraised some years ago at \$3,000,000 and the debts aggregate that sum.

Market Street Railway Deal
Rumored

Plans are said to be underway for an offer of exchange of Standard Gas & Electric Company stock for the shares of the Market Street Railway, San Francisco, Cal. It is known that the subject has been discussed more or less officially but it is stated the actual working out of the plan will take some time. The Byllesby organization obtained the privately owned railway in San Francisco when the United Railways Investment Company was acquired some time ago.

ROUTE MILEAGE OF THE UNION TRACTION
COMPANY

Lines owned:	Miles
Muncie-Anderson-Indianapolis.....	56½
Anderson-Marion-Wabash.....	53½
Alexandria-Elwood-Tipton.....	20
Indianapolis-Kokomo-Logansport.....	80
Kokomo-Peru.....	19½
Muncie-Union City.....	33
Anderson-Middletown.....	9½
Anderson City Lines.....	10
Marion City Lines.....	14½
Muncie City Lines.....	12½
Total.....	309
Lines Leased:	
Muncie-Hartford City-Bluffton.....	42
Indianapolis-New Castle-Muncie.....	62½
Muncie-Portland.....	32
	136½
Total.....	445½

Personal Items

J. F. Egolf with Western United Company

John F. Egolf, former general manager of the Aurora, Elgin & Fox River Electric Company and lately general manager of the Chicago, North Shore & Milwaukee Railroad, has been appointed operating vice-president of the Western United Gas & Electric Company, effective on Nov. 1. At the same time officials of the Western United announced that the agreement between the Western United and the General Engineering & Management Company, under which the latter concern has been operating and managing the properties of the former, would be terminated on Nov. 1.

The General Engineering succeeded Stone & Webster as operator of the Western United property on March 1, 1926, shortly after controlling interest had been acquired by E. H. Rollin & Sons and A. E. Fitkin & Company. Later the Fitkin interests were acquired by the Rollins interests, which now own practically all of the class B common of the Western United Corporation, which in turn owns all the common stock of the Western United Gas & Electric.

B. P. Alschuler, vice-president of the Western United, announced that after Nov. 1 operation of all affairs of the company will be in the hands of its own executives. The change will affect very few men now engaged in the executive offices.

Mr. Egolf will succeed B. E. Waltz, who was elected when the General Engineering came into the property and who was elected through that corporation. Mr. Egolf is well known in the railway field. He began his railroad career as a conductor on the street railway at Columbus, Ohio, in 1902 and from that position rose to assistant superintendent of the Ohio Electric Railway. Later he became general manager of the Springfield & Xenia Railway. He was president of the Illinois Electric Railway Association in 1925.

E. E. Whiting, Trustee at Boston

Edward E. Whiting, who writes the Whiting column in the *Boston Herald*, has been appointed by Governor Fuller to the position of trustee of the Boston Elevated Railway, Boston, Mass., to succeed Andrew Marshall, resigned. Mr. Whiting was born in Springfield, Mass., in 1875. He studied three years at Harvard College. He became interested in journalism through his father, who was editor of the *Springfield Republican*. Edward E. Whiting has been connected with Boston newspapers since 1903. He was at one time editor of the defunct *Boston Evening Record*, and has been on the *Boston Herald*

staff since 1921. In recent years he has written much on political matters. He succeeds Edward Marshall, who in turn succeeded James F. Jackson.

Ross Schram with Twin Coach Corporation

Ross Schram, whose name is indelibly written in the annals of transportation history in Detroit, Mich., is now vice-president in charge of sales of the Twin Coach Corporation, Kent, Ohio. He has also been elected a director of the corporation. The announcement of his appointment was made by Frank R. Fageol, president.

In 1925 Mr. Schram resigned from the



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Ross Schram

Detroit Municipal Railway after many years service. He, with Clarence E. Wilcox, former corporation counsel for the city of Detroit and later head of the claims department of the Department of Street Railways, became associated with Senator Couzens in the Couzens Ice Machine Company. It was in 1924 that Ross Schram succeeded William B. Mayo as general manager of the Detroit Department of Street Railways. He was well known at the time, having served as secretary to Mayor-elect James Couzens in 1918. Later, when construction was started on the municipal railway system, Mr. Schram was made secretary of the Street Railway Commission. When on Dec. 23, 1921, he was made assistant general manager of the Detroit Municipal Railway he knew the problems confronting the railway management and was a valuable aid to the late Joseph S. Goodwin, then general manager. Upon the death of Mr. Goodwin, Mr. Mayo resigned his place on the Street Railway Commission to become general manager and Mr. Schram continued as assistant general manager. In reality he assumed full responsibility of a 400-mile municipal system whose early history had played a conspicuous part in the making of the present-day Detroit. Further details of Mr.

Schram's rôle were given in the *ELECTRIC RAILWAY JOURNAL*, issue of July 12, 1924, page 71.

Mr. Schram was born in Battle Creek, Mich., in September, 1888. He was graduated from the Detroit University School. At one time he was connected with the Charles H. Fuller Company, the J. Walter Thompson Company and the Packard Motor Car Company.

A. W. Stace Directs Michigan Committee on Utility Information

Arthur W. Stace, Grand Rapids, has been appointed director of the Michigan Committee on Public Utility Information with offices in Ann Arbor, Mich. The committee was formed in 1920 to provide responsible information on utility operation and to promote public understanding. Through its bureau speakers are furnished for clubs and schools.

During the past four years Mr. Stace has been engaged in writing articles concerning Michigan, her resources and possibilities. For many years he was identified with the *Grand Rapids Press*, leaving the post of managing editor there to become special writer for the Booth newspapers, his particular field being constructive editorial research and studies looking to the solving of Michigan problems and the development of Michigan's natural resources.

Mr. Stace was the first president of the Michigan Associated Press Editorial association. He was graduated from Notre Dame University. In his new position he succeeds Alfred Fischer, who resigned on April 1, to become affiliated with the Semet-Solvay Engineering Corporation, New York.

J. R. Blackhall Made North Shore Manager

J. R. Blackhall, vice-president and general manager of the Chicago & Joliet Electric Railway, has been appointed general manager of the Chicago North Shore & Milwaukee Railroad at Highwood, Ill., succeeding John F. Egolf, who has returned to the Western United Gas and Electric properties a manager. No successor to Mr. Blackhall has been named so that he will divide his time between Joliet and Chicago until the Chicago & Joliet appoint a manager. Mr. Blackhall was born on Nov. 16, 1869, in a little French community named Caraqueet, in New Brunswick, Canada. He left home when he was fifteen years old, and after working in several different places in Canada he went to Portland, Me., in 1889. In the spring of 1891 he entered railway work with the Woodbridge & Turner Engineering Company, New York, which had taken a sub-contract under the Thomson-Houston Company, the engaged in electrifying the Deerlin branch of the Portland Railroad. A few months after the Woodbridge & Turner Engineering Company con-

pleted its work at Portland the company employed Mr. Blackhall on the construction of the electric railway extending from Buffalo to Tonawanda along the Lake. He was finally promoted to the position of superintendent of the road.

Subsequently Mr. Blackhall served the Woodbridge & Turner Company in connection with the electrification of the horse car lines in Providence, R. I., the construction of the Westbrook branch of the Portland (Maine) Railway, the building of the Scranton-Moosic line, the electrification of the mule lines in Chester, Pa., the installation of an electric scenic line on Briganteen Island, N. Y., the electrification of the lines in Poughkeepsie, N. Y., and the construction of the independent telephone system at Mount Vernon, N. Y.

After leaving the Woodbridge & Turner Company, Mr. Blackhall constructed an overhead line connecting the new power plant with the old system in Wilkes-Barre, Pa. He next became connected with the Portland (Maine) Railroad in charge of its electrical work and remained in Portland until the spring of 1900. He then secured a position with the American Railways, Philadelphia, on work at Bridgeton, N. J. He was next sent to Joliet by the American Railways in the capacity of electrical superintendent on the rebuilding of the local lines there and the construction of the interurban line to Chicago. Upon the completion of that work he served the American Railways in other places, returning to Joliet in January, 1904, to become manager of the Chicago & Joliet Electric Railway.

George D. Powell at Terre Haute

The appointment of George D. Powell as division engineer at Terre Haute, Ind., of the Terre Haute, Indianapolis & Eastern Traction Company is seen in an official order sent out by G. O. Nicolai of the company. Mr. Powell will be engineer of maintenance of way with supervision of all tracks, buildings and grounds of the division. He was with the Union Traction Company of Indiana before going to Terre Haute in 1926 as assistant to the late W. F. Graves.

G. L. LEDERER has been appointed local superintendent of the railway system of the Milwaukee Electric Railway & Light Company in Racine, Wis., succeeding the late A. W. Weyker.

W. J. CARR has been appointed a member of the California Railroad Commission to fill the vacancy caused by the death of Harley W. Brundige. Mr. Carr is a well-known local attorney and former State Senator from Los Angeles.

J. L. BILLINGSLEY is superintendent of the newly organized Southern Pacific Motor Transport Company, a California corporation with a permit to operate buses in Oregon. Mr. Billingsley has been superintendent of the Southern Pacific city railway lines in Salem and Eugene for the past fifteen years. His headquarters will be in Salem.

OBITUARY

Frank C. Wight

Frank C. Wight, editor of *Engineering News-Record*, one of the McGraw-Hill publications, died at his home in Summit, N. J., Sept. 18. He had been ill for only a week.

Mr. Wight was a man of brilliant attainments and remarkably broad understanding and sympathies. On these qualities and on his great administrative talents was based his success in his chosen vocation. He worked both rapidly and surely, and was incessantly active throughout his career. As an authority on reinforced concrete, Mr. Wight had contributed largely to the advancement of the art. Other subjects had also commanded his major attention during the past years, studies of the Mississippi River flood problem and traffic control among them. He was a member of Secretary Hoover's Com-



Frank C. Wight

mittee on Street and Highway Safety when that body was first organized.

Mr. Wight entered technical journalism in December, 1906, as associate editor of *Engineering News*. For six years his main assignments were in the fields of concrete, general construction and river and harbor work. In 1913 he was promoted to the managing editorship of *Engineering News*, a position which he held until *Engineering News* and *Engineering Record* were consolidated in 1917. Four years later he became managing editor of the consolidated journal, and on Jan. 1, 1924, was made editor of *Engineering News-Record*.

Mr. Wight was born in Washington, D. C., Feb. 26, 1882. He studied at Columbian (now George Washington) University and later at Cornell, where he received the degree of civil engineer in 1904. After graduation he spent three years in the office of the engineer of bridges of the District of Columbia, his previous summer vacations having been spent in the district surveyor's office.

He was a member of the American Society of Civil Engineers, the Cornell Society of Engineers, the American Concrete Institute and the Engineers Club. He had for years been active in the work of both the National Confer-

ence of Business Paper Editors and the New York Editorial Conference. Of the former organization he was president at the time of his death. He was a former chairman of the New York Editorial Conference.

A. E. Clifford

Arthur E. Clifford, business manager of *Automotive Industries*, published in Philadelphia, died suddenly at Cleveland, Ohio, on Sept. 20. For many years Mr. Clifford was connected with the McGraw Publishing Company and its successor, the McGraw-Hill Publishing Company, Inc., as business manager of the *American Electrician* and the *Electrical World*. In December, 1923, he resigned as assistant to President James H. McGraw to join the business staff of *Automotive Industries*, at that time published in New York.

In speaking of Mr. Clifford's death, Mr. McGraw said:

"Both capacity and courage were conspicuous characteristics of Arthur Clifford, whose earnest and devoted work will long be remembered by those for and with whom he labored. A large circle of friends in the McGraw-Hill Publishing Company and the United Publishers' Corporation, as well as in the other circles where he mingled, will miss him for his sterling personal and business qualities.

Mr. Clifford was born in New Hampshire 59 years ago.

CHARLES BARRETT ATTLESEY, division superintendent at the Ninth Avenue depot of the Brooklyn-Manhattan Transit Corporation, Brooklyn, N. Y., died recently. With this property he served in various capacities until in 1918 he was promoted to the position of acting division superintendent. This was made permanent on Feb. 1, 1919. His work in Brooklyn was interrupted by a short period of service with the Public Service Corporation of New Jersey. Mr. Attlessey was 58 years old.

HENRY DOERR, director of the Twin City Rapid Transit Company, Minneapolis, Minn., for the term expiring 1930, died Aug. 11 at his country home in Minnetonka. He was president of the Minneapolis Drug Company, director of the Northwestern National Bank and had been affiliated with other banking institutions. He was 74 years old.

G. T. WISWELL, president of the Wiswell Improved Railroad Crossing Company, Chicago, Ill., died on Aug. 8. He was prominent in the construction end of railroad work for more than 40 years. He was the organizer of the Roadmasters Association in Massachusetts and its first secretary. For the past ten years he gave his entire attention to his invention, the Wiswell improved railroad crossing, a noiseless, jarless, grooved flangeway patent. This invention was described in the *ELECTRIC RAILWAY JOURNAL* more than a year ago. One such pattern was recently installed on the Great Northern and Illinois Central crossing at Sioux City, Iowa.

Manufactures and the Markets

Large Expenditures Planned by Virginia Company

Double-tracking of the Bay Shore Line to Ocean View on the Norfolk Division of the Virginia Electric & Power Company, for which \$207,000 has been appropriated, is one of the many large rehabilitation and construction projects announced by officials for completion during the latter part of this year. Most of the right-of-way for the second track of the Bay Shore Line is clear and the company does not expect to have serious difficulty in completing it. With the construction of this second track, Ocean View, one of the most popular seaside resorts near the Virginia coast, will be furnished with a high-speed express service.

The company will spend in addition to the money appropriated for this work \$36,000 for reinforcing and replacing in part the primary system of its 2,000-volt distributing lines. In Norfolk it will construct an underground conduit between Bank and Cove Streets to cost \$5,300. Extensions of the power distribution system to Fentress and vicinity is estimated to cost \$6,000. Plans include the double-tracking of portions of the Church Street line and laying of new track on Church Street between Eighteenth and 26th Streets, for which \$60,000 has been allocated.

New business in Norfolk necessitates the extension of the power distribution system in various parts of the city, particularly in the suburbs. This project will cost about \$150,000. Storage and garage facilities at Cove Street substation are being improved at a \$30,000 expenditure. Sums of \$52,000 and \$53,000 respectively have been allocated to the construction of new transmission lines from the Reeves Avenue power station to Gilmerton and Newton Park. These lines will serve to strengthen the link between Norfolk and the high-tension line which runs from Gilmerton to Suffolk and permits interchange of power between Norfolk, Richmond, Petersburg and Roanoke Rapids (N. C.) generating stations. The rebuilding of an 11,000-volt transmission line will cost \$20,000 and the installation of a transformer bank at the Reeves Avenue power station \$15,000.

It is estimated that the company has spent in the territory of eastern Virginia and North Carolina \$5,530,000 for extensions and improvements during the first six months of this year and that the program under way will cost \$6,652,339. The largest project which the company has undertaken in Norfolk is the addition to the Reeves Avenue station, which has been under way for several months and which in order to put this generating plant in first class condition will absorb \$2,500,000 of the construction funds during the last half of the year. The total cost of the Reeves Avenue additions is estimated

at approximately \$5,000,000. It is understood that plans for the North Carolina extension include the acquisition of property of the independent power companies in one or more of the smaller North Carolina communities. The local plants will be scrapped and their customers supplied by current brought in over the new transmission line. Construction last year of the transmission line through the Dismal Swamp to Edenton, Hartford and other North Carolina communities makes it possible for the company to branch out in that state at a relatively small expense, for the Dismal Swamp line is not used at its full capacity at present. At Richmond the company recently received a shipment of track steel to be used in completing the work on Main Street at Fourteenth, Eighteenth and 21st Streets.

Southern Utility Completes \$100,000 Car Program

The last of seven cars built in the company owned plant of the Southern Public Utilities Company, Charlotte, N. C., has been completed. Seven cars were included in the construction program, estimated at \$100,000, and all of the units have been placed in operation. Others, it is announced, will be built as needed. In the meantime the car building shop at the company's carhouse on East Boulevard will engage in construction of bodies for cars to be used in Charlotte and Winston-Salem. Each of the new cars recently turned out cost approximately \$15,000. They are of

the double-truck type, and are for one-man or two-man operation. The frames are of steel and the bodies are constructed of steel and wood. Each unit has a seating capacity of 40 passengers. Over-all length of each car is 38 ft. 3 in. and the width over all is 8 ft. 4 in. The height, from rail to top of car, is 11 ft. 6 in. All units are equipped with air brakes and numerous safety devices. Each car is provided with comfortably upholstered seats. W. B. Osborne, master mechanic, had charge of the building details.

Noiseless One-Man Cars for Minneapolis

The Minneapolis Street Railway, Minneapolis, Minn., contemplates putting one-man noiseless cars on its Bryn Mawr line to reduce the cost of operation as on this line at times only six to eight persons are carried on a trip. T. Julian McGill, vice-president, says under the circumstances there would seem to be no necessity for using two men. If the service proves satisfactory it may be extended to other lines where there is light operation. Similar service is being discussed for some of the St. Paul lines. One-man cars are utilized for local service on the Stillwater city division and some are utilized in Duluth. The 25 new cars are to be equipped with roller bearings, automobile type brakes and herringbone gears. They will cost about \$25,000 each and will be turned out from the Snelling shops in St. Paul in three or four months.

R. H. Goodwillie Heads Electrical Manufacturers

R. H. Goodwillie, manager of the Otis Elevator Company, Yonkers, N. Y., was elected treasurer of the National Electrical Manufacturers Association by the executive committee at its meeting on Sept. 16, according to an announcement by Gerard Swope, president. Mr. Goodwillie succeeds J. W. Perry, formerly associated with the Johns-Manville Corporation, who has resigned from active business connections. I. A. Bennett of the National Metal Molding Company, Pittsburgh, Pa., will succeed Mr. Perry on the board of governors.

International G. E. Men Promoted

Loren Emery, merchandise sales manager of the International General Electric Company, has been appointed a member of the executive department and assigned to special duties in Mexico. He is succeeded as merchandise sales manager by R. A. Rowlands. George F. Mosher, assistant to treasurer of the General Electric Company, has been named auditor of disbursements, succeeding C. H. Stull, who becomes treasurer of the Ohio Contract Purchase Corporation, an associated company, with headquarters in Cleveland.

"Babies Mixed in Cleveland"

says news item

They may do that out there, but with the A.E.R.A. Exhibit Committee on deck there'll be

No Mixing of Progeny of the Street Railway and Manufacturers

Every exhibit will be tagged and everything will be in its place in the 115,007 feet of space

**Be There on Time,
October 1, at 12 Noon**

**Unless You've Decided to
Walk, Call Your Local
Ticket Agent**

New Gary Cars Embody Utmost in Comfort and Safety

Marking another step in the progressive modernization and improvement of the system, ten new light-weight safety cars for one-man operation have recently been placed in service by the Gary Railways, Gary, Ind. The entire fleet of nine city-type cars and one interurban was built by the Cummings Car & Coach Company, Paris, Ill., and embodies the most modern principles of construction and design. Car dimensions recommended by the committee on "essential features of modern cars" were followed as far as possible, the builders using the same post centers, height, etc.

From the standpoint of comfort and attractiveness to riders the new equipment is unsurpassed by but few, if any, street cars manufactured. The low dash, a feature developed by Gary Railways engineers, gives a becoming streamline appearance to the new cars which is suggestive of speed and smoothness in riding. Equipped with four 40-hp. motors each and automatic safety and control apparatus of every description, the cars are capable of unusually rapid acceleration and retardation, features which are of great importance in operating through the congested streets.

With 52 semi-individual, leather-upholstered seats and ample aisles and vestibules the new city-type cars are designed to handle heavy loads during rush hours with comfort and dispatch. Delays in loading and unloading passengers are minimized by automatic rear door treadle exits, sliding doors and a passenger signal system which not only indicates the proper door to use on boarding or leaving the car but which also warns trailing motorists of an imminent stop. Provision against sudden incapacitation of the operator is



The low vestibule rail in line with the side belt rail carries out the streamline appearance

made in the "dead man's control." With the inauguration of service with the nine safety cars on the Broadway-45th



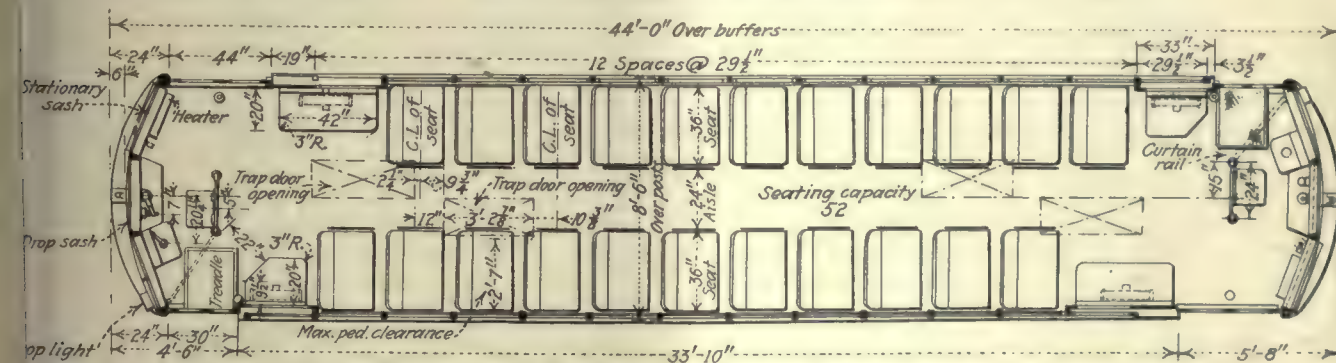
Comfort is the keynote of the interior design, the cars being equipped with semi-individual, leather-upholstered seats and having ample aisle and vestibule

Avenue line in Gary, the company increased the headway from ten to fifteen minutes.

Other specifications of the city-type cars are shown below.

The new interurban car differs from the city-type equipment only in the wider spacing and plush upholstery of its seats. Like the other units for local operation in Gary, this car, which is now being used on the Gary-Indiana Harbor interurban line, is finished on the interior in cherry with an ivory-toned ceiling. The cars are illuminated by standard Pullman fixtures and carpeted with handsome gray linoleum. Windows are properly spaced for clear and easy vision and are framed in brass sash.

The car is of the same type as the seven interurban cars received during January of this year and described in the Jan. 29 issue of ELECTRIC RAILWAY JOURNAL.



Plan of the new city type Gary cars. Although the length is only 44 ft., the cars have a seating capacity of 52 passengers

SPECIFICATIONS FOR GARY CITY UNITS

type of unit....	One-man, motor, passenger, city, double end, double truck	Car signal system.....	Faraday high-voltage	Motors.....	Four GE-265, ins'de hung
number of seats.....	52	Control.....	General Electric K-75	Painting scheme.....	Orange and maroon
date of order.....	Jan. 20, 1927	Curtain fixtures.....	National Lock Washer Co.	Registers.....	Ohmer
date of delivery.....	June 9, 1927	Curtain material.....	Black Pantasote	Roof material.....	Haskelite
total weight.....	37,000 lb.	Destination signs.....	Hunter illuminated	Safety car devices.....	Safety Car Devices Co.
motor centers.....	21 ft. 6 in.	Door mechanism.....	National Pneumatic Co.	Sash fixtures.....	Edwards, brass
length over all.....	44 ft. 0 in.	Energy-saving device.....	Economy meters	Seats.....	Hale-Kilburn 392 No. A semi-individual
truck wheelbase.....	5 ft. 4 in.	Finish.....	Sherwin-Williams lacquer	Seat spacing.....	29 1/2 in.
width over all.....	8 ft. 8 in.	Gears and pinions.....	General Electric	Step treads.....	Kass
height, rail to trolley base.....	11 ft. 0 1/2 in.	Glass.....	D.S.A.A. plate	Trolley retrievers.....	Ohio Brass Co.
window post spacing.....	29 1/2 in.	Hand brakes.....	Pittsburgh No. 35	Trolley base.....	U.S.-20
body.....	All steel	Heaters.....	Railway Utility Co. (thermostatic control)	Trolley wheels.....	Holland 6 in.
door.....	Arch	Headlights.....	Golden Glow H.D.B.	Trucks.....	Cummings Car & Coach Co., MC. No. 62
brakes.....	General Electric	Headlining.....	3-in. Agasote	Ventilators.....	Railway Utility Co., Honeycomb type
files.....	A.B.R.A. standard	Journal boxes.....	Cummings Car & Coach Co.	Wheels, type.....	26-in. Davis, steel
		Lamp fixtures.....	Dayton M'g. Co., Pullman type	Wheelguards.....	Gary Railways standard

EXHIBITOGRAPHS—No. 5



We might well label this masterpiece "Great Expectations." Here are five gentlemen steeped in the art of no-pushee-no-pullee locomotion. Begin at the left, skyward, A. M. Robinson, P.M. of the Brill-American-Kuhlman-Wason aggregation, known as "Robbie," the A.M. signifying the time of day that he is going to show the buyers some real stuff. To his right is A. P. Jenks, V.-P. of the Cummings Car & Coach Company. Behind his dignified expression lurks a knockout in the matter of the lightweight material. Will the referee raise his hand at the Cleveland bout? "Were you ever in Zinzinnati?" questions the gentleman at the extreme right, A. L. Kasemeir, V.-P. Cincinnati Car Com-

pany. What is behind this question will be revealed between Oct. 1 and 7. And he with the wings, G. L. Kippenberger, "the Spirit of St. Louis," has he another world surprise in transportation like unto Lindbergh, which he will bring from the shops of the St. Louis Car Company? Another V.-P. with a royal flush?

But who is the husky Vulcan with the hammer, standing a little to the left of center? Little Charlie Clark, who when not engaged in maintaining a way for the Cleveland Railway, is chairman of the sub-committee on car exhibits. He knows all that the four others know, but won't tell, because at present he's as busy as two bees in a tar bucket.

Copper Market Active

A much larger business in copper, with all sellers participating at 13½ cents delivered in the East, has been the feature in the non-ferrous metal markets in the week ending Sept. 20. Lead has also sold in improved volume, and the St. Louis price has advanced to 6.075 cents. Zinc and tin, however, have been quiet and slightly lower.

The large producers, who have been

holding their copper at 13½ cents delivered Connecticut, for over a month, finally brought buyers to their way of thinking, and the sales have been the largest for any week since June 1. In the East, 13½ cents was generally realized, with a fair amount of business in the Middle West at 13½ cents. Foreign sales are now about normal for this time in the month, the export association's price continuing at 13½ cents, c.i.f.

The week has witnessed better business in lead, leading to an improved tone in the St. Louis market toward the end of the week. This had the effect of bringing the St. Louis price up to 6.075 cents. The New York sales have also improved, but the market price has not risen to correspond with the St. Louis quotation. In many quarters not only is no rise in price expected, but uncertainty is expressed as to whether 6.25 cents New York is rock bottom.

Galvanizers have shown but little interest in zinc this week. Until Sept. 19 6½ cents, St. Louis, was generally realized, with an occasional carload at slightly higher prices.

Tin has been declining steadily, and even at the present low prices sales are not being made in any quantity.

METAL, COAL AND MATERIAL PRICES
F. O. B. REFINERY

Metals—New York		Sept. 20, 1927
Copper, electrolytic, cents per lb.	12.95	
Copper wire, cents per lb.	15.25	
Lead, cents per lb.	6.075	
Zinc, cents per lb.	6.225	
Tin, Straits, cents per lb.	61.50	
Bituminous Coal, f.o.b. Mines		
Smokeless mine run, f.o.b. vessel, Hampton Roads, gross tons	\$4.275	
Somerset mine run, Boston, net tons	1.80	
Pittsburgh mine run, Pittsburgh, net tons	1.95	
Franklin, Ill., screenings, Chicago, net tons	↑	
Central, Ill., screenings, Chicago, net tons	↑	
Kansas screenings, Kansas City, net tons	2.70	
†Quotations withdrawn because of strike.		
Materials		
Rubber-covered wire, N. Y., No. 14, per 1,000 ft.	\$5.55	
Weatherproof wire base, N. Y., cents per lb.	20.50	
Cement, Chicago net prices, without bags	2.05	
Lined oil (5-bbl. lots), N. Y., cents per lb.	11.3	
White lead in oil (100-lb. keg), N. Y., cents per lb.	13.75	
Turpentine (bbl. lots), N. Y., per gal.	\$61.0	

ROLLING STOCK

SEABOARD AIR LINE RAILWAY, Portsmouth, Va., has placed an order with the J. G. Brill Company, Philadelphia, for ten combination gas-electric passenger cars and nine trailers. The equipment will be used by the railroad in local interurban service. In addition to this four gas-electric cars will be built by the Electromotive Company, East Cleveland, Ohio, according to an announcement recently made by the Timken Roller Bearing Company, Canton, Ohio, which will equip the cars with its bearings.

CLEVELAND RAILWAY, Cleveland, Ohio, has ordered twenty White six-cylinder buses, which brings the company's quota to 100 vehicles, including trucks.

GREAT NORTHERN RAILWAY, St. Paul, Minn., has placed an order with the Westinghouse Electric & Manufacturing Company for six additional locomotives to be used on the Cascade Mountain electrification project. This is part of the \$15,000,000 program of improvement which includes line revisions and an 8-mile tunnel through the Cascade Mountain.

TRADE NOTES

ATLAS CONVEYOR COMPANY, Philadelphia, announces the opening of offices at 20 South Fifteenth Street, Philadelphia, and the appointment of Percival K. Reed, L. G. Weygandt and E. A. Thumler as chief engineer, Eastern sales manager and general manager, respectively.

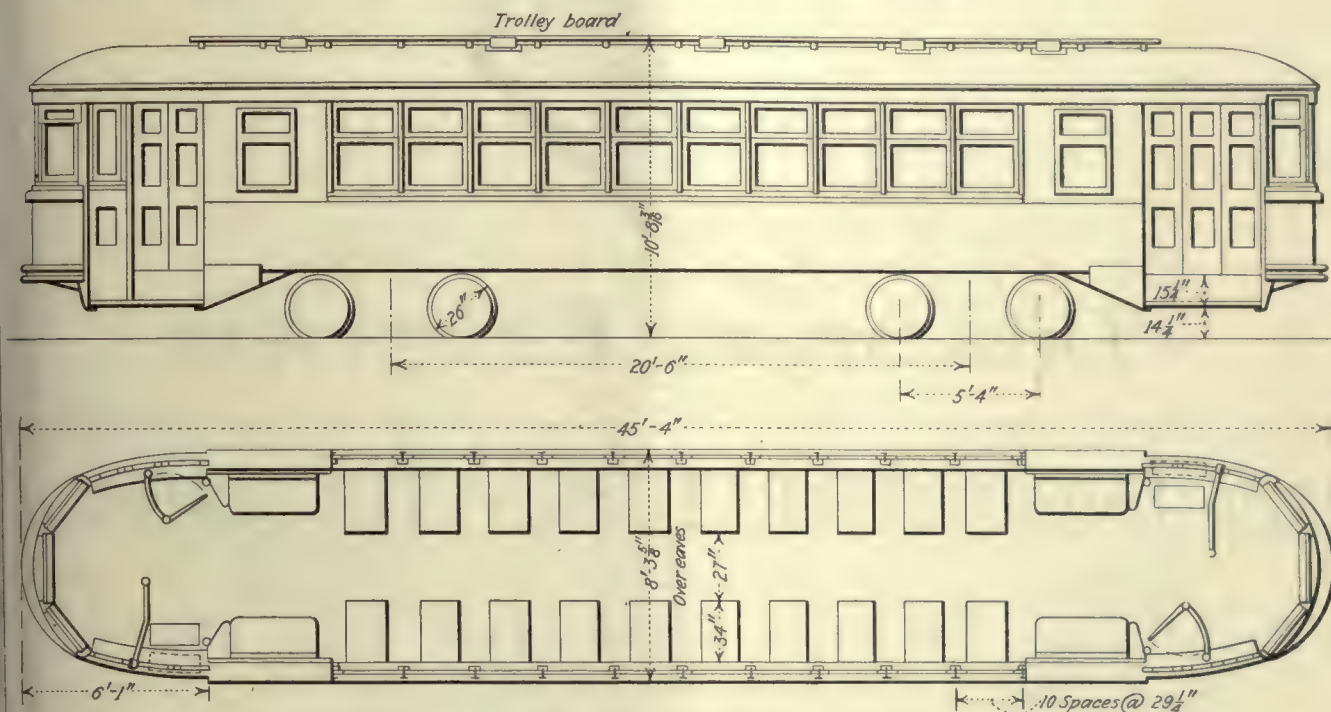
UNITED STATES RUBBER COMPANY, New York, has announced to the trade an important addition to its line, the Usco Junior.

DELTA-STAR ELECTRIC COMPANY, Chicago, Ill., announces the purchase of the Electric Connector Company, Minneapolis, Minn., manufacturer of compression connectors. The connectors will be made now in the Chicago factory.

MALCOLM S. SIMPSON, Suite 1401 Starks Building, Louisville, Ky., has been appointed as direct sales representative for the Morton Manufacturing Company (railroad division) in the territory surrounding Louisville and including those electric railway systems located in that territory.

GENERAL WHEELBARROW COMPANY, Cleveland, Ohio, announces that the name of the Akron Barrow Company, Cleveland, has been changed to that of General Wheelbarrow Company. The announcement states that the old name is geographically wrong for a Cleveland company; also, that need was felt for a name which would be broader, more inclusive and indicative of the scope of its business. The renamed company will remain under the same management.

Atlanta does it again!



Orders 40 more cars equipped with "Peacock" Staffless Brakes—

Reg. U. S. Pat. Off.



"Peacock"

Reg. U. S. Pat. Off.

Staffless Brakes

CONTINUING its modernization policy the Georgia Power Company, Atlanta, Ga., has just placed in service forty one-man, city type, double-end cars, with a passenger seating capacity of 48.

Built by the Cincinnati Car Company, these new cars are all steel, over 46 ft. long. The exterior color scheme is green and cream while the interior trim is a natural cherry.

May we tell you of the many advantages of "Peacock" Staffless Brakes which led this company to specify them again?

National Brake Company

890 Ellicott Square, Buffalo, N. Y.

Canadian Representative

Lyman Tube & Supply Co., Ltd., Montreal, Can.



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Keystone Metal Quarry Catalog Metal Quarry Directory
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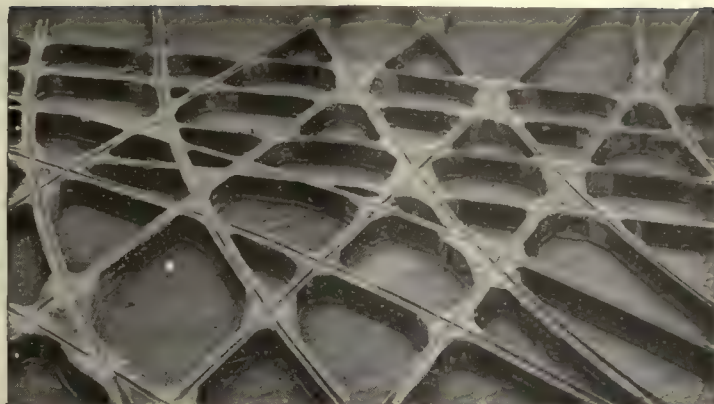
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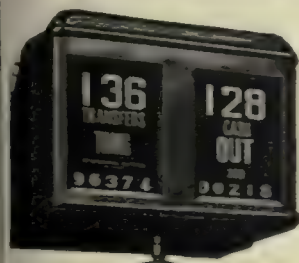
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ASSISTANT general manager, man preferred who has held similar position and who from experience would be able to entirely manage property within few months. Position is in Latin American country. Therefore, knowledge of Spanish desirable. Bus operating experience also desirable. In first letter, give full details, experience and salary expected. P-44, Electric Railway Journal, Tenth Ave. at 36th St., New York City.

HELPER in car barn, G.E. equipment, Westinghouse air brakes. State age, references and wages expected. The Cortland County Traction Company, Cortland, N. Y.

POSITIONS WANTED

CORRESPONDENCE solicited with managers that are in need of an experienced equipment supervisor, one who has proven that he can maintain all types of cars and busses in an attractive and reliable condition at minimum of cost, a good organizer, a man who is loyal and one that works in harmony with all departments, references, past and present employers. PW-40, Electric Railway Journal, 7 So. Dearborn St., Chicago, Ill.

POSITIONS WANTED

MASTER mechanic with twenty years' experience on different types of car equipment, also with experience in power house and track maintenance, wants a position with a small or medium size trolley system. Best of references. Ready to go anywhere at once. PW-45, Electric Railway Journal, Tenth Ave. at 36th St., New York.

POSITION as superintendent for a small trolley system, wanted by a man with experience in the different branches. Several years in charge of power plants, car equipments and tracks. The last eight years in full charge of a 38 car trolley system. Best of references. PW-46, Electric Railway Journal, Tenth Ave. at 36th St., New York.

TRACK foreman out of work, is looking for a position. Broad experience. References furnished. PW-47, Electric Railway Journal, Tenth Ave. at 36th St., New York.

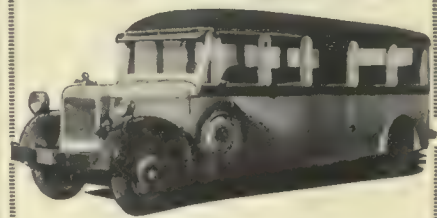
WOULD like to correspond with any company needing a high-grade official in any capacity, in city or interurban railroads. Can manage any or all departments in the most efficient manner. PW-33, Electric Railway Journal, Guardian Bldg., Cleveland, O.

FOR SALE

15 BIRNEY SAFETY CARS

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Cars Complete—Low Price—Fine Condition
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Commonwealth Bldg., Philadelphia, Pa.

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For Quick Disposition

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 - 3—Fageols, Street Car Type. 29 Pass.
 - 3—Macks, Street Car Type.. 20 Pass.
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All in first class condition—dual rear tires—some with extra tires

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Electrical engineer, Member A. I. E. E., with a background of responsible executive employment in electric railway operation (surface and rapid transit) and in association with prominent manufacturers of electric railway and power equipment.
This knowledge and experience should be particularly valuable to an operating or holding corporation that needs a better understanding of its railway and power equipment.
Now employed, desire to change.
Preliminary correspondence for confidential exchange of additional information is invited.
PW-43, Electric Railway Journal
Tenth Ave. at 36th St., New York City.

One Insertion

of a

“Searchlight” Ad

is often all that is necessary
to locate a buyer.

If there is anything you want—

or something you don't want that *other* readers of this paper can supply—or use—advertise in the

SEARCHLIGHT SECTION

Somebody is always looking for something to meet certain business needs. Some men in charge of plant operations may be in the market for good used equipment—others may have just what they want, to sell. Some may require a man of unusual quali-

fications for a particular position—that man may be another reader of this paper!
Put the Searchlight Section to work for you under any of the following classifications—to fill your business needs.

- Agencies Wanted
Agents Wanted
Auction Notices
Buildings For Sale
Business Opportunities
Civil Service Opportunities
Contracts To Be Let
- Contracts Wanted
Educational Courses
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For Rent Items
Franchises
Industrial Sites
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New Industries Wanted
Partners Wanted
Patents For Sale
Patent Attorneys
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Positions Vacant
- Positions Wanted
Property For Sale
Receivers' Sales
Representatives Wanted
Salesmen Wanted
Work Wanted
Etc., Etc., Etc.

WHAT AND WHERE TO BUY

Equipment, Apparatus and Supplies Used by the Electric Railway Industry
with Names of Manufacturers and Distributors Advertising in this Issue

Advertising, Street Car
Collier, Inc., Barron G.

Air Brakes
Westinghouse Air Brake Co.

Anchor, Guy
Elec. Service Supplies Co.
Ohio Brass Co.
Westinghouse E. & M. Co.

Armature Shop Tools
Columbia Machine Works
Elec. Service Supplies Co.

Automatic Return Switch
Stands
Ramapo Ajax Corp.

Automatic Safety Switch
Stands
Ramapo Ajax Corp.

Axles
Bemis Car Truck Co.
Bethlehem Steel Co.
Brill Co., The J. G.
Carnegie Steel Co.
Cincinnati Car Co.
St. Louis Car Co.
Standard Steel Works
Westinghouse E. & M. Co.

Babbitt Metal
National Bearing Metals Corp.

Babbitting Devices
Columbia Machine Works & M. I. Co.

Barges, Steel
American Bridge Co.

Badges and Buttons
Elec. Service Supplies Co.
International Register Co.

Batteries, Dry
Nichols-Lintern Co.

Bearings and Bearing Metals
Bemis Car Truck Co.
Brill Co., The J. G.
Cincinnati Car Co.
Columbia Machine Works & M. I. Co.
General Electric Co.
National Bearing Metals Corp.
St. Louis Car Co.
Westinghouse E. & M. Co.

Bearings, Center and Roller
Side
Cincinnati Car Co.
Columbia Machine Works
Stucki Co., A.

Bearings, Roller
Timken Roller Bearing Co.

Bells and Buzzers
Consolidated Car Heating Co.

Bells and Gongs
Brill Co., The J. G.
Cincinnati Car Co.
Columbia Machine Works & M. I. Co.
Elec. Service Supplies Co.
St. Louis Car Co.

Benders, Rail
Railway Trackwork Co.

Bodies, Bus
Brill Co., The J. G.
St. Louis Car Co.

Body Material, Haskellite and Plymet
Haskellite Mfg. Corp.

Bolters
Babcock & Wilcox Co.

Bond Testers
American Steel & Wire Co.
Electric Service Supplies Co.

Bonding Apparatus
American Steel & Wire Co.
Elec. Service Supplies Co.
Ohio Brass Co.
Railway Trackwork Co.
Una Welding & Bonding Co.

Bonds, Rail
American Steel & Wire Co.
Elec. Service Supplies Co.
General Electric Co.
Ohio Brass Co.
Railway Trackwork Co.
Una Welding & Bonding Co.
Westinghouse E. & M. Co.

Brackets and Cross Arms
(See also Poles, Ties, Posts, etc.)
American Bridge Co.
Eates Expanded Steel Truss Co.
Columbia Machine Works
Elec. Ry. Equipment Co.
Elec. Service Supplies Co.
Hubbard & Co.
Ohio Brass Co.

Brake Adjusters
Brill Co., The J. G.
Cincinnati Car Co.
National Ry. Appliance Co.
Westinghouse Tr. Br. Co.

Brake Shoes
American Brake Shoe & Foundry Co.
Bemis Car Truck Co.
Brill Co., The J. G.
St. Louis Car Co.

Brake Testers
National Ry. Appliance Co.

Brakes, Brake Systems and Brake Parts
Bemis Car Truck Co.
Brill Co., The J. G.
Cincinnati Car Co.
Columbia Machine Works & M. I. Co.
General Electric Co.
National Brake Co.
St. Louis Car Co.
Westinghouse Tr. Br. Co.

Brakes, Magnetic Rail
Cincinnati Car Co.

Bridges, Steel
American Bridge Co.

Brushes, Carbon
General Electric Co.
Jeandron, W. J.
LeCarbone Co.
Westinghouse E. & M. Co.

Brushholders
Columbia Machine Works

Buildings, Steel
American Bridge Co.

Bulkheads
Haskellite Mfg. Corp.

Bunkers, Coal
American Bridge Co.

Buses
Yellow Truck & Coach Co.

Bus Lighting
National Ry. Appliance Co.

Bushings, Case Hardened and Manganese
Bemis Car Truck Co.
Brill Co., The J. G.
Cincinnati Car Co.
Columbia Machine Works
St. Louis Car Co.

Cables (See Wires and Cables)
Cambrie Tapes, Yellow and Black Varnish
Irvington Varnish & Ins. Co.
Mica Insulator Co.

Carbon Brushes (See Brushes, Carbon)
Car Lighting Fixtures
Elec. Service Supplies Co.
Car Panel Safety Switches
Consolidated Car Heating Co.
Westinghouse E. & M. Co.

Car Steps, Safety
Cincinnati Car Co.

Car Wheels, Rolled Steel
Bethlehem Steel Co.

Cars, Dump
Brill Co., The J. G.
Differential Steel Car Co.
St. Louis Car Co.

Cars, Gas-Electric
Brill Co., The J. G.
General Electric Co.
Westinghouse E. & M. Co.

Cars, Gas, Rail
Brill Co., The J. G.
St. Louis Car Co.

Cars, Passenger, Freight, Express, etc.
American Car Co.
Brill Co., The J. G.
Cincinnati Car Co.
Kuhlman Car Co. G. C.
St. Louis Car Co.
Wason Mfg. Co.

Cars, Second Hand
Electric Equipment Co.

Cars, Self-Propelled
Brill Co., The J. G.
General Electric Co.

Castings, Brass Composition or Copper
Cincinnati Car Co.
Columbia Machine Works & M. I. Co.
National Bearing Metals Corp.

Castings, Gray Iron and Steel
American Bridge Co.
American Steel Foundries
Bemis Car Truck Co.
Columbia Machine Works & M. I. Co.
St. Louis Car Co.
Standard Steel Works

Castings, Malleable & Brass
Bemis Car Truck Co.
Columbia Machine Works & M. I. Co.
St. Louis Car Co.

Catchers and Retrievers, Trolley
Elec. Service Supplies Co.
Ohio Brass Co.
Wood Co., Chas. N.

Catenary Construction
Archbold-Brady Co.

Ceiling Car
Haskellite Mfg. Corp.

Ceilings, Plywood, Panels
Haskellite Mfg. Corp.

Change Carriers
Cleveland Fare Box Co.
Electric Service Supplies Co.

Change Trays
Cincinnati Car Co.

Circuit-Breakers
General Electric Co.
Westinghouse E. & M. Co.

Clamps and Connectors for Wires and Cables
Columbia Machine Works
Elec. Ry. Equipment Co.
Elec. Service Supplies Co.
General Electric Co.
Hubbard & Co.
Westinghouse E. & M. Co.

Cleaners and Scrapers Track (See also Snow-Flows, Sweepers and Brooms)
Brill Co., The J. G.
Cincinnati Car Co.
Ohio Brass Co.
St. Louis Car Co.

Clusters and Sockets
General Electric Co.

Coil Banding and Winding Machines
Columbia Machine Works & M. I. Co.

Coils, Service Supplies Co.
Westinghouse E. & M. Co.

Coils, Armature and Field
Columbia Machine Works & M. I. Co.

General Electric Co.
Westinghouse E. & M. Co.

Coils, Choke and Kicking
Elec. Service Supplies Co.
General Electric Co.
Westinghouse E. & M. Co.

Coin Changers
Johnson Fare Box Co.

Coin Counting Machines
Cleveland Fare Box Co.
International Register Co.
Johnson Fare Box Co.

Coin Sorting Machines
Cleveland Fare Box Co.
Johnson Fare Box Co.

Coin Wrappers
Cleveland Fare Box Co.

Commutator Slotters
Columbia Machine Works
Elec. Service Supplies Co.
General Electric Co.
Westinghouse E. & M. Co.
Wood Co., Chas. N.

Commutator Truing Devices
General Electric Co.

Commutators or Parts
Cameron Electrical Mfg. Co.
Columbia Machine Works & M. I. Co.

General Electric Co.
Westinghouse E. & M. Co.

Compressors, Air
General Electric Co.
Westinghouse Tr. Br. Co.

Condensers
General Electric Co.
Westinghouse E. & M. Co.

Condenser Papers
Irvington Varnish & Ins. Co.

Connectors, Solderless
Westinghouse E. & M. Co.

Connectors, Trailer Car
Columbia Machine Works
Consolidated Car Heating Co.

Elec. Service Supplies Co.
Ohio Brass Co.

Controllers or Parts
Columbia Machine Works & M. I. Co.

General Electric Co.
Westinghouse E. & M. Co.

Controller Regulators
Elec. Service Supplies Co.

Controlling Systems
General Electric Co.
Westinghouse E. & M. Co.

Converters, Rotary
General Electric Co.
Westinghouse E. & M. Co.

Conveying & Hoisting Machinery
American Bridge Co.

Copper Wire
American Brass Co.
American Steel & Wire Co.
Anaconda Copper Mining Co.

Copper Wire Instruments, Measuring, Testing and Recording
American Brass Co.
Anaconda Copper Mining Co.

Cord, Bell, Trolley, Register
American Steel & Wire Co.
Brill Co., The J. G.
Elec. Service Supplies Co.
International Register Co.
Roebbing's Sons Co., John A.
St. Louis Car Co.
Samson Cordage Works

Cord Connectors and Couplers
Elec. Service Supplies Co.
Samson Cordage Works
Wood Co., Chas. N.

Couplers, Car
American Steel Foundries
Brill Co., The J. G.
Cincinnati Car Co.
St. Louis Car Co.
Ohio Brass Co.
Westinghouse Traction Brake Co.

Cowl Ventilators
Nichols-Lintern Co.

Cranes, Hoists & Lifts
Electric Service Supplies Co.

Cross Arms (See Brackets)
Crossing Foundations
International Steel Tie Co.

Crossings
Ramapo Ajax Corp.
Wm. Wharton, Jr. & Co.

Crossings, Frogs & Switches
Ramapo Ajax Corp.
Wm. Wharton, Jr. & Co.

Crossings, Manganese
Bethlehem Steel Co.
Ramapo Ajax Corp.
Wm. Wharton, Jr. & Co.

Crossings, Track (See Track Special Work)
Crossings, Trolley
Ohio Brass Co.
Westinghouse E. & M. Co.

Curtains and Curtain Fixtures
Brill Co., The J. G.
St. Louis Car Co.

Dealer's Machinery & Second Hand Equipment
Electric Equipment Co.
Hyman Michaels

Derailing Devices (See also Track Work)
Derailing Switches
Ramapo Ajax Corp.

Destination Signs
Columbia Machine Works & M. I. Co.

Elec. Service Supplies Co.
Detective Service
Wish-Servic, P. Edward

Door Operating Devices
Brill Co., The J. G.
Cincinnati Car Co.
Consolidated Car Heating Co.
National Pneumatic Co.

Doors & Door Fixtures
Brill Co., The J. G.
Cincinnati Car Co.
General Electric Co.
Hale-Kilburn Co.
St. Louis Car Co.

Doors, Folding Vestibule
National Pneumatic Co.

Drills, Track
American Steel & Wire Co.
Electric Service Supplies Co.
Ohio Brass Co.

Driers, Sand
Electric Service Supplies Co.
Ohio Brass Co.
Westinghouse E. & M. Co.

Ears
Columbia Machine Works & M. I. Co.
Elec. Service Supplies Co.
Ohio Brass Co.
Westinghouse E. & M. Co.

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Railway Trackwork Co.

Electric Transmission Towers
American Bridge Co.

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John A. Roebbing's Sons Co.

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Railway Trackwork Co.
Una Welding & Bonding Co.

Electrodes, Steel
Railway Trackwork Co.
Una Welding & Bonding Co.

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Beeler, John A.
Bibbins, J. Rowland
Bylesby Co., H. M.
Dav & Zimmermann, Inc.
Falle & Co., H. H.
Ford, Bacon & Davis
Hemphill & Wells

Hoist, Engelhardt W.
Jackson, Walter
Kalkner & DeLong
Linn & Marshall Co.
McClellan & Junkersfeld
Richey, Albert S.
Sanderson & Porter
Stevens & Wood
Stons & Webster Co.
White Eng. Corp., The J. G.

Engines, Gas, Oil or Steam
Westinghouse E. & M. Co.

Exterior Side Panels
Haskellite Mfg. Corp.

Fare Boxes
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Johnson Fare Box Co.
Perry Mfg. Co.

Fare Registers
Electric Service Supplies Co.
Johnson Fare Box Co.

Fences, Woven Wire & Fence Posts
American Steel & Wire Co.

Fenders and Wheel Guards
Brill Co., The J. G.
Cincinnati Car Co.
Consolidated Car Heating Co.
St. Louis Car Co.
Star Brass Works
Wood Co., Chas. N.

Fibre and Fibre Tubing
Westinghouse E. & M. Co.

Field Cords (See Cords)
Electric Service Supplies Co.

Floor, Sub
Haskellite Mfg. Corp.

Floors
Haskellite Mfg. Corp.

Forgings
Brill Co., The J. G.
Cincinnati Car Co.
Standard Steel Works

Frogs & Crossings, Tee Rail
Bethlehem Steel Co.
Ramapo Ajax Corp.
Wm. Wharton, Jr. & Co.

Frogs, Track (See Track Work)
Frogs, Trolley
Electric Service Supplies Co.
Ohio Brass Co.
Westinghouse E. & M. Co.

Furnaces Electric, Steel Melting
American Bridge Co.

Fuses and Fuse Boxes
Columbia Machine Works & M. I. Co.
Consolidated Car Heating Co.
General Electric Co.
Westinghouse E. & M. Co.

Fuses, Refillable
General Electric Co.

Gaskets
Westinghouse Tr. Br. Co.

Gas Producers
Westinghouse E. & M. Co.

Gates, Car
Brill Co., The J. G.
Cincinnati Car Co.
St. Louis Car Co.

Gear Blanks
Brill Co., The J. G.
Standard Steel Works

Gear Cases
Chillingworth Mfg. Co.
Columbia Machine Works & M. I. Co.

Electric Service Supplies Co.
Westinghouse E. & M. Co.

Gears and Pinions
Bemis Car Truck Co.
Columbia Machine Works & M. I. Co.

Electric Service Supplies Co.
General Electric Co.
Nat'l Ry. Appliance Co.

Generating Sets, Gas-Electric
General Electric Co.

Generators
General Electric Co.
Westinghouse E. & M. Co.

Grinder Balls
Bethlehem Steel Co.
Lorain Steel Co.

Gongs (See Bells and Gongs)
Greases (See Lubricants)

Grinders, Portable
Railway Trackwork Co.

Grinders, Portable Electric
Railway Trackwork Co.

Grinding Bricks and Wheels
Railway Trackwork Co.

Guard Rail Clamps
Ramapo Ajax Corp.

Guard Rails, Tee Rail & Manganese
Ramapo Ajax Corp.
Wm. Wharton, Jr. & Co.

Guards, Trolley
Elec. Service Supplies Co.
Ohio Brass Co.

Harnes, Trolley
Columbia Machine Works
Elec. Service Supplies Co.
National Bearing Metals Corp.

Star Brass Works
(Continued on page 30)

Used and Surplus Equipment

INDIVIDUAL items of used equipment, or surplus new equipment, or complete plants, are disposed of (and found) through advertising in the *Searchlight* Section of this paper.

This is the section which so effectively aided the Government in selling the many millions of dollars worth of surplus material and equipment accumulated during the war without disturbing the market.

"SEARCHLIGHT"

THE WORLD'S STANDARD

"IRVINGTON"

Black and Yellow
Varnished Silk, Varnished Cambric, Varnished Paper
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Irvington Varnish & Insulator Co.

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A. L. Gillies, Toronto Martin Woodard, Seattle
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The DIFFERENTIAL CAR



Standard on
60 Railways for

Track Maintenance
Track Construction
Ash Disposal
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Waste Handling
Excavated Materials
Hauling Cross Ties
Snow Disposal

Use These Labor Savers

Differential Crane Car
Clark Concrete Breaker
Differential 3-way Auto Truck Body
Differential Car Wheel Truck and Tractor

THE DIFFERENTIAL STEEL CAR CO., Findlay, O.



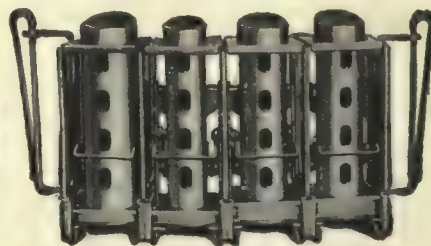
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Johnson Electric Fare Boxes and overhead registers make possible the instantaneous registering and counting of every fare. Revenues are increased 1½ to 5% and the efficiency of one-man operation is materially increased. Over 4000 already in use.

When more than two coins are used as fare, the Type D Johnson Fare Box is the best manually operated registration system. Over 50,000 in use.

Johnson Change-Makers are designed to function with odd fare and metal tickets selling at fractional rates. It is possible to use each barrel separately or in groups to meet local conditions. Each barrel can be adjusted to eject from one to five coins or one to six tickets.



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National Railway Appliance Co.

Graybar Building, 420 Lexington Ave., New York

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Hegeman-Castle Corporation, Railway Exchange Building, Chicago, Ill.

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Genesco Paint Oils
Dunham Hopper Door Device
Garland Ventilators
Walter Tractor Snow Plows
Feasible Drop Brake Staffs

Ft. Pitt Spring & Mfg. Co.
Springs
Flaxinum Insulation
Anderson Slack Adjusters
Economy Electric Devices Co.
Power Saving and Inspection
Meters
"Topesaid" Lamps
Bus Lighting Equipment
Cowdrey Automotive Brake
Testing Machine



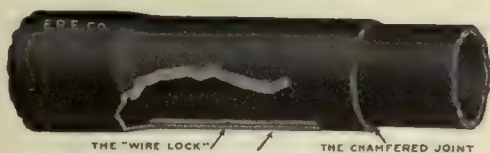
FARE BOXES for BUSES

Let us tell you of this especially designed box for this class of service.

The Cleveland Fare Box Co.
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Preston, Ontario

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Ohio Brass Co.
St. Louis Car Co.
- Headlining**
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Haskelite Mfg. Corp.
Heaters, Bus
Nichols-Lintern Co.
Heaters, Car (Electric)
Consolidated Car Heating Co.
Gold Car Heat. & Ltg. Co.
Railway Utility Co.
Smith Heater Co., Peter
Heaters, Car, Hot Air and Water
Smith Heater Co., Peter
Heaters, Car Stove
Smith Heater Co., Peter
Helmets, Welding
Railway Trackwork Co.
Una Welding & Bonding Co.
- Holsts & Lifts**
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Hose, Bridges
Ohio Brass Co.
- Hose, Pneumatic**
Westinghouse Traction Brake Co.
- Instruments, Measuring, Testing and Recording**
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General Electric Co.
National Ry. Appliance Co.
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General Electric Co.
Irvington Varnish & Ins. Co.
Mica Insulator Co.
Okonite Co.
Okonite-Callender Cable Co.
Westinghouse E. & M. Co.
- Insulating Silk**
Irvington Varnish & Ins. Co.
- Insulating Varnishes**
Irvington Varnish & Ins. Co.
- Insulation (See also Paints)**
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Elec. Service Supplies Co.
General Electric Co.
Irvington Varnish & Ins. Co.
Mica Insulator Co.
Okonite Co.
Okonite-Callender Cable Co.
Westinghouse E. & M. Co.
- Insulation Slots**
Irvington Varnish & Ins. Co.
- Insulator Pins**
Elec. Service Supplies Co.
Hubbard & Co.
Ohio Brass Co.
- Insulators (See also Line Materials)**
Elec. Ry. Equipment Co.
Elec. Service Supplies Co.
General Electric Co.
Irvington Varnish & Ins. Co.
Ohio Brass Co.
Westinghouse E. & M. Co.
- Interior Side Linings**
Haskelite Mfg. Corp.
- Interurban Cars (See Cars)**
- Jacks (See also Cranes, Hoists and Lifts)**
Buda Company
Columbia Machine Works & M. I. Co.
Elec. Service Supplies Co.
- Joints, Rail**
(See Rail Joints)
- Journal Boxes**
Bemis Car Truck Co.
Brill Co., The J. G.
Cincinnati Car Co.
St. Louis Car Co.
- Lamp Guards and Fixtures**
Elec. Service Supplies Co.
General Electric Co.
Westinghouse E. & M. Co.
- Lamps, Arc and Incandescent (See also Headlights)**
General Electric Co.
Westinghouse E. & M. Co.
- Lamps, Signal and Marker**
Elec. Service Supplies Co.
Nichols-Lintern Co.
- Lanterns, Classification**
Nichols-Lintern Co.
- Letter Boards**
Cincinnati Car Co.
Haskelite Mfg. Corp.
- Lighting Fixtures, Interior**
Electric Service Supplies Co.
- Lighting Protection**
Elec. Service Supplies Co.
General Electric Co.
Westinghouse E. & M. Co.
- Line Material (See also Brackets, Insulators, Wires, etc.)**
Archbold-Brady Co.
Electric Ry. Equipment Co.
Elec. Service Supplies Co.
- General Electric Co.**
Hubbard & Co.
National Bearing Metals Corp.
Ohio Brass Co.
Westinghouse E. & M. Co.
Locking Spring Boxes
Wm. Wharton, Jr. & Co.
Locomotives, Electric
Cincinnati Car Co.
General Electric Co.
St. Louis Car Co.
Westinghouse E. & M. Co.
Lubricating Engineers
Universal Lubricating Co.
Lubricants, Oil and Grease
Universal Lubricating Co.
Manganese Parts
Bemis Car Truck Co.
Manganese Steel Guard Rails
Ramapo Ajax Corp.
Wm. Wharton Jr. & Co.
Manganese Steel, Special
Track Work
Bethlehem Steel Co.
Wm. Wharton, Jr. & Co.
Manganese Steel Switches, Frogs and Crossings
Bethlehem Steel Co.
Ramapo Ajax Corp.
Wm. Wharton, Jr. & Co.
Meters (See Instruments)
Mica
Mica Insulator Co.
Mirrors, Inside & Outside
Cincinnati Car Co.
Motor and Generator Sets
General Electric Co.
Motor Buses (See Buses)
Motor Trucks
International Harvester Co.
Motors, Electric
General Electric Co.
Westinghouse E. & M. Co.
Motorman's Seats
Brill Co., The J. G.
Cincinnati Car Co.
Elec. Service Supplies Co.
St. Louis Car Co.
Wood Co., Chas. N.
Nuts and Bolts
Bemis Car Truck Co.
Cincinnati Car Co.
Hubbard & Co.
Oils (See Lubricants)
Omnibuses (See Buses)
Oxygen
International Oxygen Co.
Packing
Westinghouse Traction Brake Co.
Paints and Varnishes (Insulating)
Elec. Service Supplies Co.
Irvington Varnish & Ins. Co.
Paints & Varnishes, Railway
Dixon Crucible Co., Joseph
National Ry. Appliance Co.
Panels, Outside, Inside
Haskelite Mfg. Corp.
Pickup, Trolley Wire
Elec. Service Supplies Co.
Ohio Brass Co.
Pinion Pullers
Elec. Service Supplies Co.
General Electric Co.
Wood Co., Chas. N.
Pinions (See Gears)
Pins, Case Hardened, Wood and Iron
Ohio Brass Co.
Westinghouse Traction Brake Co.
Pipe Fittings
Standard Steel Works
Westinghouse Tr. Brake Co.
Planers (See Machine Tools)
Plates for Tee Rail Switches
Ramapo Ajax Corp.
Pliers, Rubber Insulated
Elec. Service Supplies Co.
Plywood, Roofs, Headlinings, Floors, Interior Panels, Bulkheads, Truss Planks
Haskelite Mfg. Corp.
Pole Line Hardware
Bethlehem Steel Co.
Elec. Service Supplies Co.
Ohio Brass Co.
Pole Reinforcing
Hubbard & Co.
Poles, Metal Street
Bates Expanded Steel Truss Co.
Elec. Ry. Equipment Co.
Hubbard & Co.
Poles, Ties, Posts, Piling & Lumber
Naurle Pole & Tie Co.
Poles, Trolley
Elec. Service Supplies Co.
Poles, Tubular Steel
Elec. Ry. Equipment Co.
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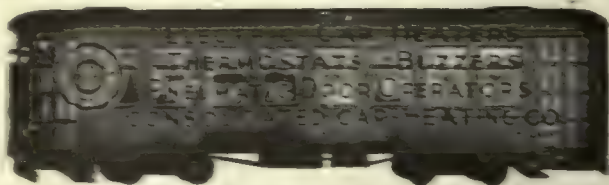
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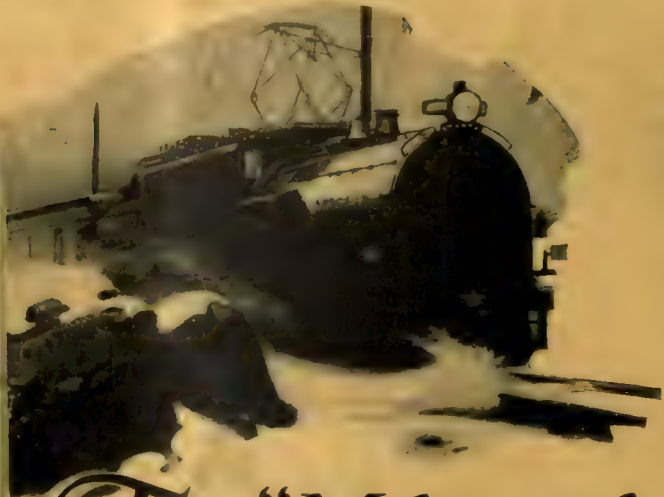
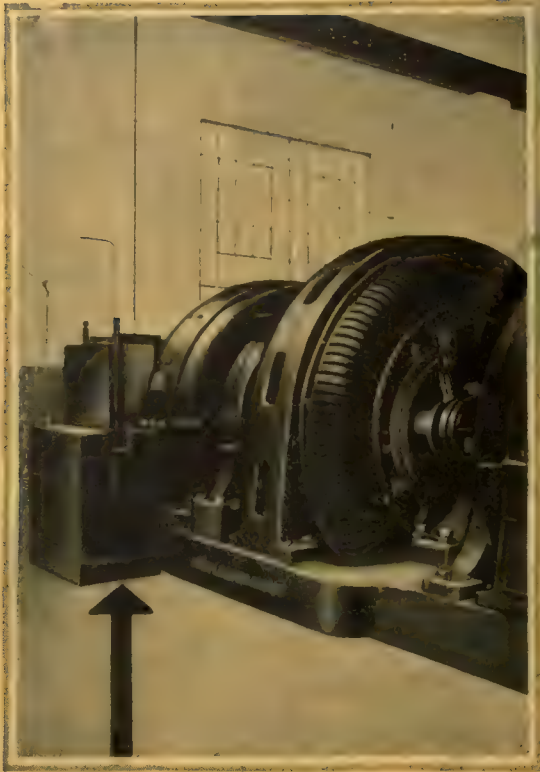
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See this page in next issue.



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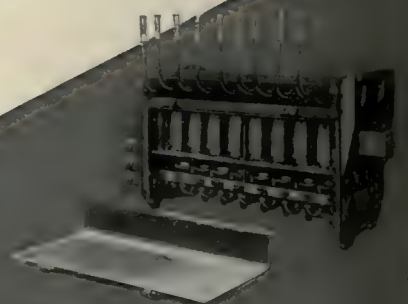
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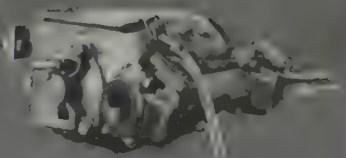
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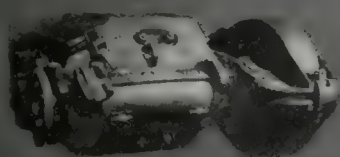
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East Pittsburgh, Pa.



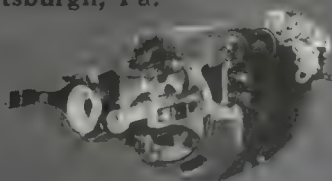
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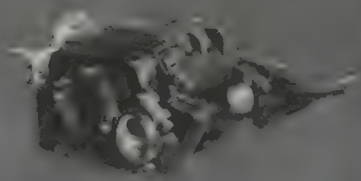
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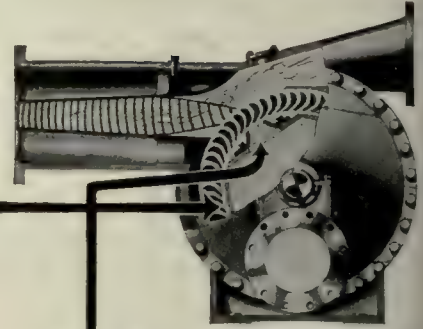


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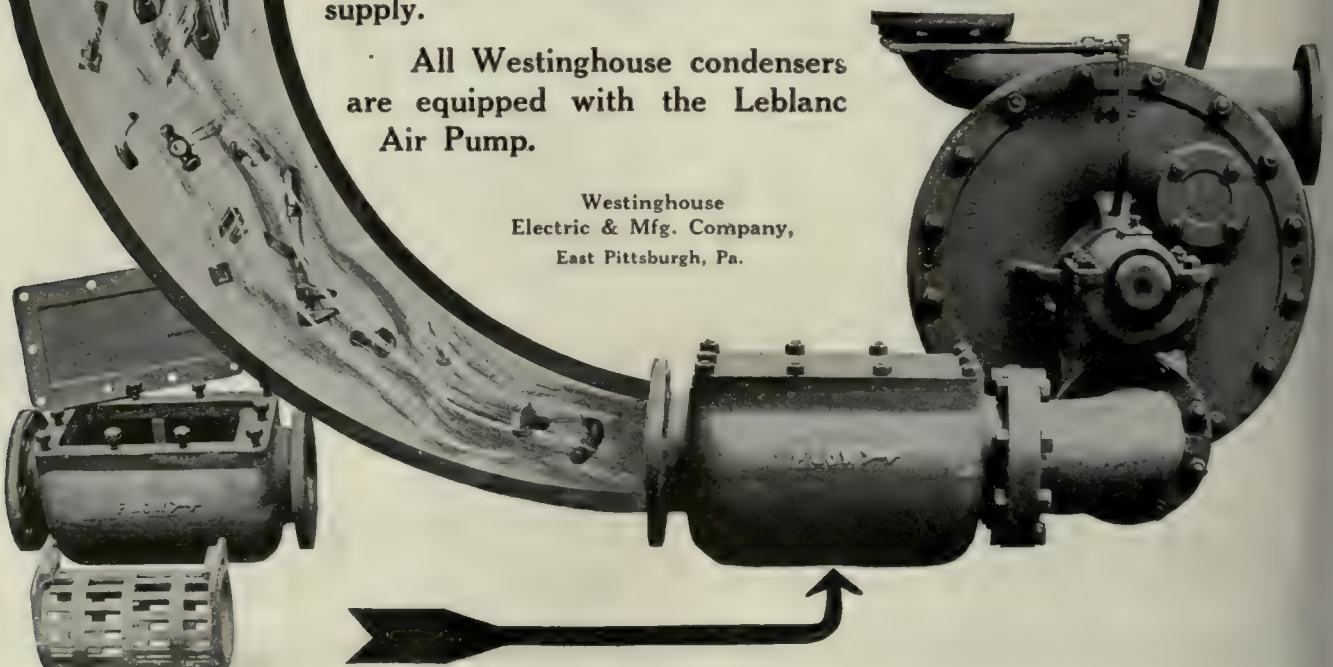


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Southern Illinois Railway & Power Co.



Southern Pacific Railway

**A few typical installations of Westinghouse Overhead Construction
on Steam and High-Speed Interurban Electric Railroads**

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*W. E. & M. Co. of Texas

Specialization

Produces Highest Efficiency

Air Brake building is a business in itself—and one of the most important, because of the lives and property the Air Brake protects. It is necessarily an intensive, concentrated business. It is a specialist's business, and to obtain best results should be conducted by specialists.

A co-ordination of the various departments of our carefully arranged organization fits us for this work. Our inspectors and engineers, who are daily on the firing line of railroad work, learn all the details of local conditions, then make definite recommendations to the designers, who design and test out the recommended apparatus, after which a specially equipped factory, manned by experienced mechanics, produces a device perfectly fitted to the requirements of each particular railroad. We have thus solved many problems, and invite you to permit us to solve yours.

Our line of products is broad and covers the entire field of electric railroad braking, from the simple Straight Air Brake for single cars to the Variable Load Brake for multiple unit electric trains. We recommend Westinghouse Straight Air Brake with Emergency Feature for slow moving city cars; Westinghouse Automatic, Quick Action, for two or more suburban cars; Westinghouse Universal Equipment with either electric or pneumatic control for interurban or electrified steam road service; and Westinghouse Variable Load Equipment, electrically controlled, for elevated, subway and surface trains.

We build air brakes of all kinds to suit each and every class of service. We manufacture but one product—Air Brakes—and we're Specialists in that.

Westinghouse Traction Brake Company

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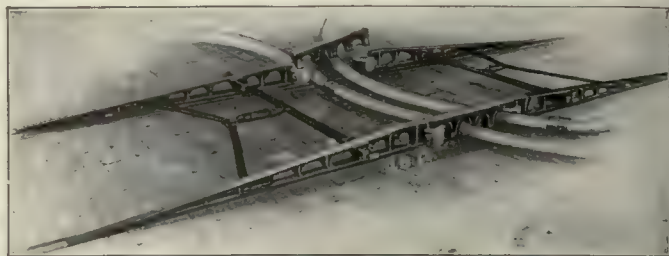
Member Society for Electrical Development

"Do It Electrically"





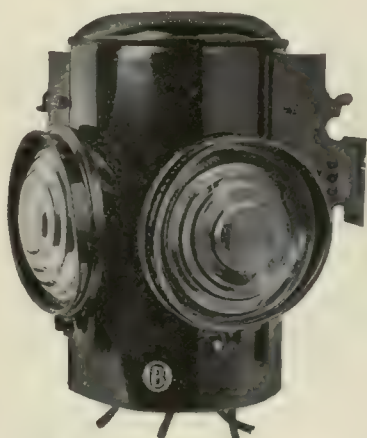
O-B Trolley Retriever



O-B Hose Bridge



O-B Trolley Catcher



O-B Electric Car Signal System



O-B Sander Valve



O-B Trolley Wire Pick-up

O-B Car

Has been developed to fulfill definite needs in a way which will increase the return from the cars on which it is used.

The O-B Engineers have investigated carefully the requirements of the trade in designing each device. Their own ideas and the ideas and suggestions of railway men have been combined in the various designs.

Never was a design considered complete

The Ohio Mansfield

Manufacturers of Line Material,
General Sales Agents in United States



O-B Tomlinson Form 8 Air Connecting Coupler



O-B Electric Coupler for Mounting on Tomlinson Coupler

Equipment

and the device ready for sale until it was proved clearly that a real need existed and that the design as it stood met that need in every way.

Any one of the O-B devices installed on your cars will either lower maintenance costs, increase the factor of safety or add to the comfort and convenience of your cars—perhaps all three.

Furthermore, O-B equipped cars spend less time in the repair shop than others.



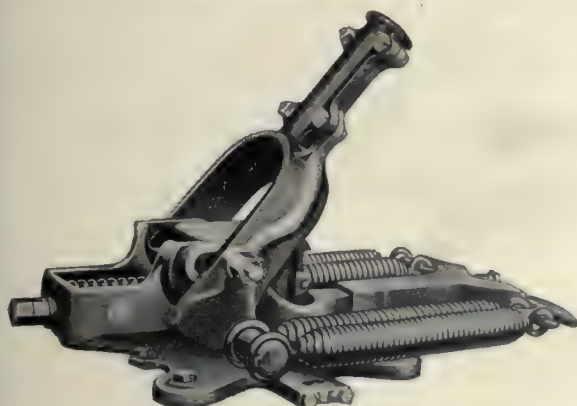
Crouse-Hinds Imperial Luminous Arc Headlights



Crouse-Hinds Imperial Incandescent Headlights

Brass Co.
Dio, U. S. A.

Equipment, Rail Bonds and Insulators.
Crouse-Hinds Imperial Headlights



O-B Trolley Base



O-B Whistle Valve



Whenever You Think of Light Projection



Type DLS Projector for
flood lighting

Remember This—

That "Golden Glow"—the name behind these famous headlights and flood lights—stands for a powerful beam of golden-yellow light which is non-blinding and fog and dust penetrating. A beam of light which can be produced only by the famous "Golden Glow" mirrored glass reflectors.

"Golden Glow" Reflectors are the result of much scientific research and perfection. They are moulded from a greenish-yellow glass, ground by special patented machinery to a true parabola and polished and silvered as would be the finest French plate mirrors.

When projecting the light from an incandescent lamp they absorb the violet, ultra-violet and other high-frequency rays, thus projecting a beam of golden-yellow light which is non-blinding and wonderfully penetrating.

For Construction Work—

"Golden Glow" Projectors are used for flood-lighting large spaces where construction work is carried on at night. They offer many advantages over the various methods now used, being more practical, more efficient and more economical. They are equipped with the famous "Golden Glow" Reflectors, thus producing a powerful light which is non-blinding and wonderfully penetrating. These features of "Golden Glow" light make it particularly adapted to flood lighting.

***There Is No Other "Golden Glow"
Reflector — Our Patented
Process Fixes That***

ELECTRIC SERVICE SUPPLIES CO.

Manufacturer of Railway Material and Electrical Supplies

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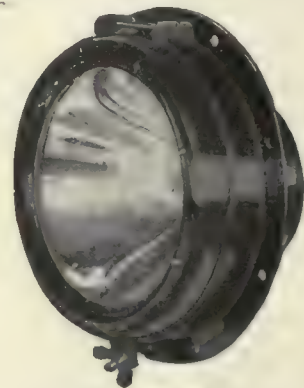
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Think of the Famous "Golden Glow"

For City and Suburban Service—

"Golden Glow" Headlights for city and suburban service are well known for their efficiency and economy. Their famous reflectors project maximum light, which means that a lamp of minimum capacity may be used. And while in the city streets the headlights may be dimmed by our standard dimming resistance unit.



Type SR-95 for
City and Suburban Service

For Interurban Service—

"Golden Glow" Headlights have many times been proved the most practical for interurban service, offering, as they do, a powerful beam of non-blinding, fog and dust penetrating light, which compares favorably in volume with the high powered arc headlights. And the cost of operation of "Golden Glow" Headlights is insignificant as compared to arc headlight maintenance.

See Them at the Convention—

Whenever you think of light projection think of the "Golden Glow." At the Convention you will find all types of "Golden Glow" Headlights and Projectors on display in our space No. 414. You are cordially invited to look them over.

***"Golden Glow"—That Powerful,
Non-Blinding, Fog and Dust
Penetrating Beam of Light***



Type T-128 for
Interurban Service

ELECTRIC SERVICE SUPPLIES Co.

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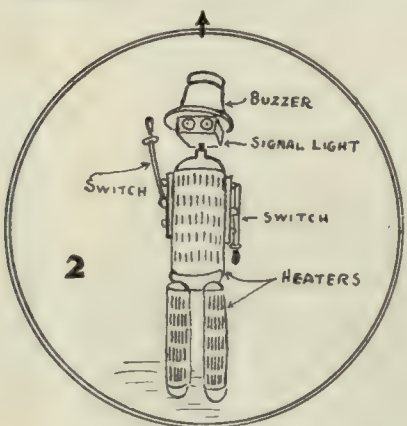


He sees the motorman wait for the Consolidated signal light before starting the car—this means that the doors have been shut and that therefore the platform accident has been entirely eliminated.

He sees the Consolidated New Electro-Pneumatic geared type door engine close the door with a smooth, gliding motion without slamming—and knows that the door is held shut with a positive lock and that the air is turned off to prevent any leakage.



Consolidated Specialty-Man is always at your service whether you need Heaters, Door Devices, Buzzers, Single Stroke Bells, Signal Lights, Relays or Resistances.



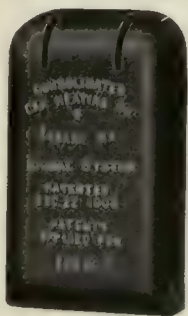
Consolidated Specialty - Man
Boards the Car.

1

He sits down and the grateful warmth, mild and uniformly distributed from the Consolidated heater, keeps him comfortable during his journey—the thermostat keeps the heater under perfect control.



For Highest Operating The CONSOLIDATED



The Consolidated Signal Light
was the first and original motorman's signal light—and 90 per cent. of such installations are still Consolidated. There must be a reason. It has a green and white light. The green is the normal starting signal—the white being provided only for additional safety.



The Consolidated Heater

"The Heater That Set the Pace for Others."

Has patented ventilated glazed porcelain core.

Has patented return lead.

Has patented double back. All the heat inside the car.

70,000 out of 90,000 Cars in the U. S.

Consolidated Car

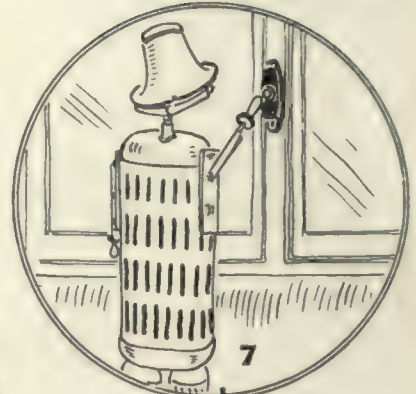
New York

Albany





He notices that the motorman stops when the Consolidated Buzzer is operated by the passenger and . . .



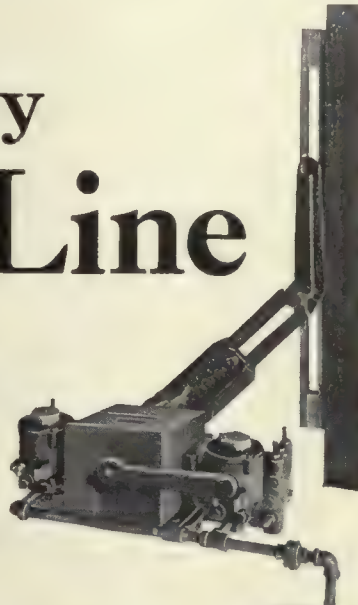
Having arrived at his destination he pushes the new Consolidated all-moulded type push button, signalling the motorman and conductor of his intention to alight.

ing Efficiency DATED Line

The Consolidated Door Engine

closes the door smoothly—quietly—without slamming—closes it with a positive lock. It *thinks* for the passengers' safety—cannot pinch.

There is no air-pressure on the piston leathers between stops, because the air is always "off" when the door is not in operation. The highest present-day development of electro-pneumatic door control.



The Consolidated Push-Button

is the simplest and ruggedest passengers' car-stop signal on the market. Equipped with Fahnestock spring-clip connectors instead of binding screws. Without being unnecessarily bulky or in the least unsightly, it projects just the right distance from the post. The passenger never has to fumble for it—it is always ready at finger's end.



On some roads a Consolidated single stroke bell is used by which the conductor also signals the motorman without the use of Bell Cords—this bell rings from the same resistance that the Buzzer system employs.

He waits by the door for the car to stop and the door is prevented from opening by the Consolidated Relay until the car has come to a full stop . . .

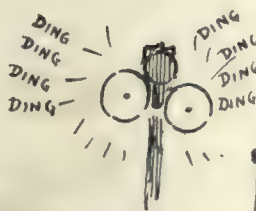


Are Heated by Consolidated Heaters

Heating Co.

Chicago

He then alights and hears the trolley crossing signal Bell which has warned the passing automobile and pedestrian of the car's approach . . .



10



Lord Railway Car

HORNE DOUBLE ACTING BRAKE

The Latest Advance in Car Brake Design

A pressure on the hand brake rod of 3000 pounds in a few seconds by virtue of the new double acting feature.

Weight 68 lb.—the lightest weigh hand brake now manufactured.



- No Slack Chain
- No Lost Motion
- No "Stuck Brakes"
- No Rusted and Mud Coated Gears
- No Flying Handles or Wheels
- No Clearance Problems

A complete hand brake requiring no accessory parts.

"The Double Ratchet Does It"

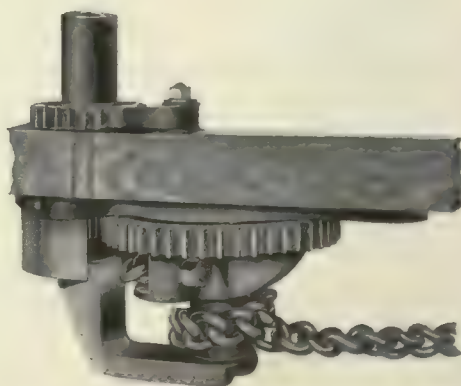
GIANT GEARED BRAKE

A simple device designed for attachment to any type of equipment. Just square the end of the rake staff and drop it in place.

Manufactured in three power ratios, the highest developing a hand brake pressure of 2800 lb.

For light weight equipment and "One Man" cars the "Midget" brake has been designed along the general lines of the Giant Brake.

While the complete weight of the Midget Brake is only 23 lbs. it develops hand brake pressures from 800 lb. to 1250 lb.



LORD MANUFACT

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Equipment Devices

LORD SCREENLESS AIR CLEANER

Prevents injurious foreign substances from entering the air compressor.

One of the great advantages of this system is found in the fact that the foreign substances are collected in the oil well of the cleaner, thus keeping the intake passage clear and affording at all times an unrestricted flow of air.

It's so good that the big air-brake makers recommend it as part of the outfit. Let this simple device keep your compressors out of trouble.



Q-P TROLLEY CATCHER

3 moving parts

(1) the spring; (2) ratchet teeth, rope reel and square centrifugal hub in one piece; (3) the pawl. All ruggedly built.

Results achieved by this simple method of constructing Q-P Trolley Catchers are absolute reliability, light weight and the reduction of maintenance expense to a point seldom reached by any other device containing springs and ratchets.

In fact, the first cost of Q-P Trolley Catchers is virtually the final expense.

Buy the sensible device.

To reduce maintenance cost install the Q-P.

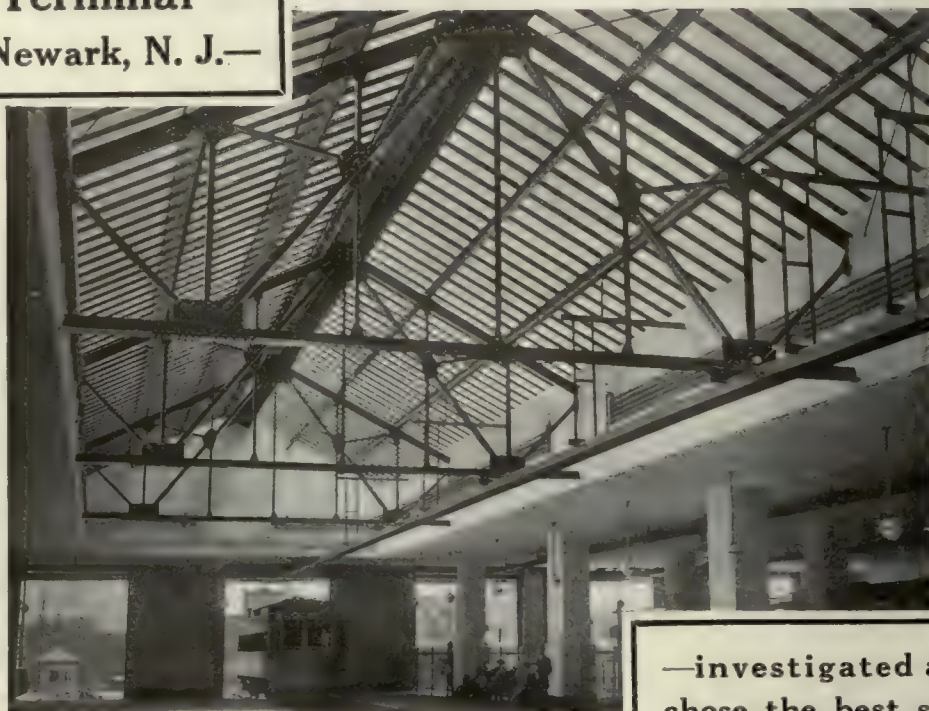


JURING COMPANY

West 40th St., New York

The New
Public Service
Terminal
at Newark, N. J.—

ANTI-PLUVIUS
(Trade Mark)
Puttyless Skylights
Patented



ANTI-PLUVIUS
(Trade Mark)
Puttyless Skylights
Patented

—investigated and
chose the best sky-
light for Public Ser-
vice Terminals and
Carhouses.

“Partner to the Sun”

Sunlight!

The one absolute need of all men who work! The one absolute need of every electric railway shop! The health giver, the production raiser of your shops—is the Sun. The Sun prevents accidents, insures healthy, happy workers and increases output. You *must* have the Sun in your shops and carhouses.

Skylight!

Skylights—“Anti-Pluvius” Puttyless Skylights—are the connecting link between Sun and shop. The “Anti-Pluvius” Puttyless Skylight is “partner to the Sun.” Maximum light area, due to all-steel construction, makes “Anti-Pluvius” the floodlight skylight, the light that opens your repair-shop roof to the Sun—the sunlight skylight!

Shoplight!

Shoplight—economical, unlimited—can only be insured by a strong (steel constructed), leakless (puttyless), standard design (Drouvé) skylight. Every construction detail of “Anti-Pluvius” merits your investigation. Throughout the country it has been tested by companies you know—Cleveland City Ry., Havana Electric Ry., Holyoke St. Ry. Co., Detroit United Rys., Boston Elevated Rys. List of others on request.

Features that make Drouvé Daylighting the best adapted to Electric Railways include exclusive “Safety Bridge.” Investigate! Our expert engineers will analyze your problems, answer your questions, and submit plans.

THE G. DROUVÉ CO.

Bridgeport, Ct.

180 N. Dearborn St., Chicago, Ill.

ELECTRIC RAILWAY JOURNAL

New York, September 30, 1916

Volume XLVIII

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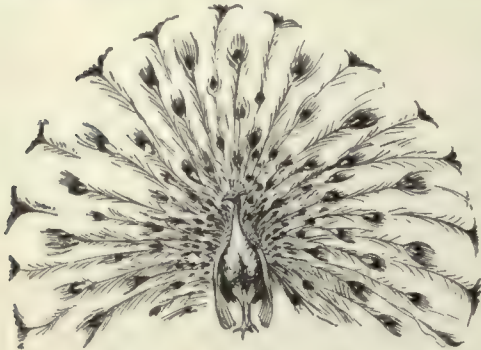
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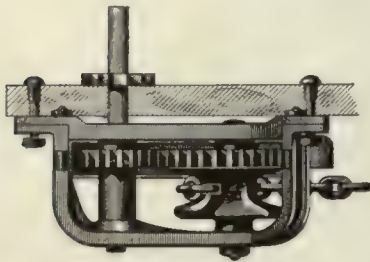
Circulation of this issue 8000 copies



Peacock

How Peacock Brakes Have Developed Cars While Retaining Their Function Ratio; the Quick - Winding Eccentric

From Light to Heavy Cars



The First Peacock, Showing the Symmetrical Drum



The Second Peacock, Types A and B, Introducing the Eccentric Drum



Type C, Introducing the Large Winding Drum



Type E, Designed to Clear the Drawbar

In this Car Development Number of the Electric Railway Journal it is fitting that we should present a little history to show you why the Peacock Brake was the best brake yesterday, why it is the best brake today and why it is likely to be the best brake tomorrow.

First, there was the "Peacock" of more than a decade ago. It was designed for and made good on small cars with simple brake rigging, and the little additional power required was readily furnished by comparatively small gears.

Second, ere the pioneer "Peacock" had been used less than two years, a new design was brought out for heavier cars with brake rigging which was more complex and harder to release. The eccentric drum, coupled with the roller bearing, gave the desired means for quickly winding the increased slack in the chain and rigging and for providing a smooth release.

Third, with the adoption of heavy cars and four-motor equipments came the Peacock Type C with its 12:48 gear ratio and large winding drum. The power and slack absorbing qualities of this Peacock made it the standard for the heavy Chicago city cars of 1907 and for interurban service.

Fourth, to meet changes in drawbar requirements, came the Peacock Type E, which demanded less space under the platform.

National Brake

Ellicott Square

Progress

With the Evolution of Electric Railway
 Metal Features of the Balanced Gear
 and the Easy-Turning Roller Bearing

From Heavy to Light Cars

And then came the great reversal in car weight and design—the return to the light car and the small one-man car. But, of course, the new cars were different in many ways, as in providing low floors and calling for more compact equipment, especially on platforms. Hence, we introduced

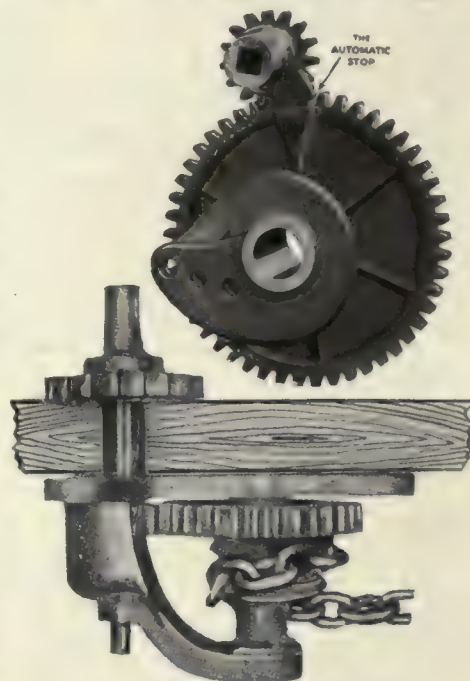
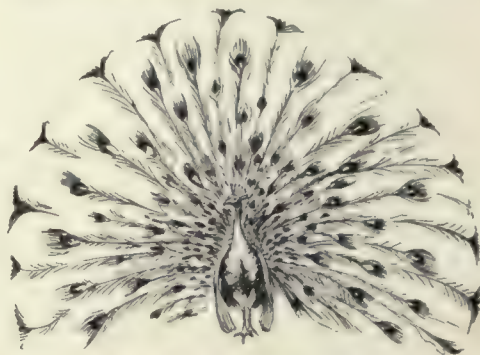
Fifth, the Peacock Type G, which, devised originally for and now used on all the storage battery cars of New York's congested streets, is equally efficient for one-man cars. Think of it—a brake weighing only 25 lb., which gives a chain tension of more than 1200 lb.

Sixth, returning to the Peacock for large cars, we found it possible not only to produce a lighter frame and one which required less fitting, but also to add the now-famous automatic stop. In this brake the amount of winding has been reduced to the minimum.

Seventh, to provide adequate braking facilities on cars with limited platform space the Peacock staffless brake was designed with a pressed steel case projecting into the vestibule only $3\frac{1}{4}$ in., a brake which occupies an insignificant amount of space, and ready to deliver all the power that can be used to advantage on a car.

Although the changes in both cars and brakes have been many, the test of years has shown that the combination of the balanced gear ratio, the quick-winding eccentric and the easy-turning roller bearing is essential to obtain efficiency in braking. We call this combination the "Peacock Brake." Change in the design of application may be necessary for your cars, but the brake you should have will be a *Peacock Brake*, because the combination described is to be had under no other name.

Peacock Company
 Buffalo, N. Y.



Type G, Light Yet Powerful



The Peacock Staffless



No. 7

No. 10

No. 4-A

No. 5-A

EARLL

Catchers and Retrievers

No. 7 Catcher

A simple, strong, reliable Catcher which has been unrivaled for the past 10 years. Has interlocking pawls which prevent hitching, twelve teeth in the back insuring quick action and minimum rise when trolley jumps. Large rope space.

No. 10 Catcher

A new design. Weighs 8 lb., particularly adapted for one-man, as well as ordinary city cars. Rope is attached by knot tied in its end, no hooks or chains; drum does not run away when rope is detached. Tension spring may be wound from front without taking Catcher from car. It is provided with the new Free-Winding tension spring, which is more efficient than common type and cannot be broken by over-winding.

No. 4-A Retriever

Has Ratchet Winding of the retrieving spring, adjustability of the retrieving action, extreme simplicity and lightness, large rope space and the Free-Winding tension spring, all exclusive Earll features.

No. 5-A Retriever

Is identical with the No. 4-A and contains in addition the Emergency Release, another exclusive Earll feature.

The Earll Retrievers have been on the market over 15 years. They have just been redesigned and improved. They are now made of better material and workmanship than ever before.

New catalog goes into detail—write for your copy

OFFICES
11 Broadway, New York

C. I. EARLL

W. R. Kerschner Co., Inc.

Eastern Sales Agents
50 Church Street, New York

FACTORY
York, Pa.

Brown & Hall
St. Louis, Mo.

The John S. Black Co.
New Orleans, La.

Ready-Reference Index

to products manufactured by advertisers in this issue of Electric Railway Journal

MORE than 300 different products are here listed. The Alphabetical Index (see page 22) gives the page number of each advertisement in this, the Annual Convention Section.

For page numbers of advertisements appearing in the Current News Section, see alphabetical index in that Section.

AS far as possible advertisements are classified in Sections, so that those relating to the same kind of equipment or apparatus will be found together.

If you do not find listed in these pages any product of which you desire the name of the maker, write or wire Electric Railway Journal, and we will promptly furnish the information.

An asterisk () indicates advertisements appearing only in the International Edition.*

Acetylene Apparatus. (See Cutting Apparatus, Oxy-Acetylene.)

Acetylene Service.
Davis-Bournonville Co.
Oxweld Acetylene Co.
Prest-O-Lite Co., Inc., The.

Advertising, Street Car.
Collier, Inc., Barron G.

Air Cleaners.
Lord Mfg. Co.

Alloys, Steel & Iron.
Titanium Alloy Mfg. Co.

Alloys, and Bearing Metals. (See Bearings and Bearing Metals.)

Anchors, Guy.
Electric Service Supplies Co.
Garton Co., W. R.
Holden & White.
Johns-Manville Co., H. W.
Ohio Brass Co.
Western Electric Co.
Westinghouse Elec. & M. Co.

Anti-Climbers.
Railway Improvement Co.

Armature and Field Coils.
*Fleming Birkby & Goodall, Ltd.
Eureka Co.

Armature Shafts.
Valley Steel Co.

Automobiles and Busses.
Brill Co., The J. G.
General Vehicle Co.
White Co., The.

Axle Straighteners.
Columbia M. W. & M. I. Co.

Axles.
Bemis Car Truck Co.
Brill Co., The J. G.
Carnegie Steel Co.
Cincinnati Car Co.
St. Louis Car Co.
Standard Steel Works Co.
Taylor Elec. Truck Co.
U. S. Metal and Mfg. Co.
Valley Steel Co.
Westinghouse Elec. & M. Co.

Babbitting Devices.
Columbia M. W. & M. I. Co.

Badges and Buttons.
American Railway Supply Co.
Electric Service Supplies Co.
International Register Co.
Western Electric Co.

Bankers and Brokers.
Coal & Iron National Bank.
Coffin & Burr.
Harris Forbes & Co.
National City Co.
Kelly, Cooke & Co.
Redmond & Co.
Young, C. G.

Batteries, Dry.
Johns-Manville Co., H. W.
Western Electric Co.

Batteries, Storage.
Electric Storage Battery Co.
*Pritchett & Gold, Ltd.
Western Electric Co.

Bearings, Center.
Baldwin Locomotive Works.
Holden & White.

Bearings and Bearing Metals.
Ajax Metal Co.
Bemis Car Truck Co.
Columbia M. W. & M. I. Co.
General Electric Co.
Hardy & Sons, Wm. A.
Kerschner Co., Inc., W. R.
Long Co., E. G.
More-Jones Brass & M. Co.
Post & Co., E. L.
St. Louis Car Co.
Taylor Elec. Truck Co.
Westinghouse Elec. & M. Co.

Bearings, Oilers, Graphite Bronze and Wood.
Bound Brook Oil-less Bearing Co.
Fleming, Birkby & Goodall, Ltd.

Bearings, Roller and Ball.
Gurney Ball Bearing Co.
Hess-Bright Mfg. Co.
Railway Roller Bearing Co.

Bearings, Roller Side.
Holden & White.

Bells and Gongs.
Brill Co., The J. G.
Electric Service Supplies Co.
St. Louis Car Co.
Western Electric Co.

Benders, Rail.
Niles-Bement-Pond Co.
Wharton, Jr. & Co., Inc., Wm

Blow Torches for Soldering and Brazing. (See Cutting Apparatus, Oxy-Acetylene.)

Blowers.
General Electric Co.
Westinghouse Elec. & M. Co.

Boiler Cleaning Compounds.
Dearborn Chemical Co.

Boiler Coverings.
Johns-Manville Co., H. W.

Boiler Graphite.
Dixon Crucible Co., Joseph.

Boilers.
Babcock & Wilcox Co.

Bond Clips.
Electric Railway Improve. Co.

Bond Testers.
American Steel & Wire Co.
Roller-Smith Co.

Bonding Apparatus.
Davis-Bournonville Co.
Electric Railway Improve. Co.
Ohio Brass Co.
Oxweld Acetylene Co.
Prest-O-Lite Co., Inc., The.

Bonding Tools.
American Steel & Wire Co.
Electric Railway Improve. Co.
Electric Service Supplies Co.
Ohio Brass Co.

Bonds, Rail.
American Steel & Wire Co.
Electric Railway Improve. Co.
Electric Service Supplies Co.
Garton Co., W. R.
General Electric Co.
Johns-Manville Co., H. W.
Ohio Brass Co.
Roebing's Sons Co., John A.
Union Electric Co.
Western Electric Co.
Westinghouse Elec. & M. Co.

Bonds, Welded.
Lincoln Bonding Co.

Book Publishers.
McGraw-Hill Book Co., Inc.

Boosters.
*Pritchett & Gold, Ltd.

Boring Tools, Car Wheel.
Niles-Bement-Pond Co.

Braces, Rail.
Kilby Frog & Switch Co.
Steel Car Forge Co.

Brackets and Cross Arms. (See also Poles, Ties, Posts, Piling and Lumber.)
American Bridge Co.
Bates Expanded Steel Truss Co.
Electric Ry. Equipment Co.
Electric Service Supplies Co.
International Creco. & C. Co.
Lindsley Bros. Co.
Ohio Brass Co.
Union Electric Co.
Western Electric Co.

Brake Adjusters.
American Brake Co.
Johns-Manville Co., H. W.
Barbour-Stockwell Co.
Kerschner Co., Inc., W. R.
Smith-Ward Brake Co.

Brake Shoes.
American Brake S. & Fdy. Co.
Barbour-Stockwell Co.
Brill Co., The J. G.
Columbia M. W. & M. I. Co.
Long Co., E. G.
St. Louis Car Co.
Taylor Elec. Truck Co.

Brakes, Brake Systems and Brake Parts.
Ackley & Co., G. G. S.
Allis-Chalmers Mfg. Co.
Bemis Car Truck Co.
Brill Co., The J. G.
*British Westinghouse Elect. & Mfg. Co.
*Bruce Peebles & Co., Ltd.
Columbia M. W. & M. I. Co.
*Dick, Kerr & Co., Ltd.

General Electric Co.
Holden & White.
Long Co., E. G.
Lord Mfg. Co.
*Maschinenfabrik Oerlikon, Ltd.
National Brake Co.
National Safety Device & Mfg. Co.
St. Louis Car Co.
Taylor Elec. Truck Co.
Westinghouse Trac. Brake Co.

Brazing. (See Welding.)

Bridges & Buildings.
American Bridge Co.

Brooms, Track, Steel or Rattan.
Paxson Co., J. W.
Western Electric Co.

Brushes, Carbon.
Calebaugh Self - Lubricating Carbon Co.
Corliss Carbon Co.
Dixon Crucible Co., Joseph.
General Electric Co.
Jeandron, W. J.
Morgan Crucible Co.
Speer Carbon Co.
Western Electric Co.
Westinghouse Elec. & M. Co.

Brush Holders.
Anderson Mfg. Co., A. & J. M.

Buckets, Grab.
Beaumont Co., R. H.

Bumpers, Car Seat.
Electric Service Supplies Co.

Bunkers, Coal.
American Bridge Co.
Beaumont Co., R. H.

Bunting.
Boyle & Co., Inc., John.

Bushings, Fibre.
Diamond State Fibre Co.

Bushings, Graphite & Wooden.
Bound Brook Oil-less Bearing Co.

Bushings, Case Hardened Mangane.
Bemis Car Truck Co.

Buttons. (See Badges and Buttons.)

Cables. (See Wires and Cables.)
Carbon Brushes. (See Brushes, Carbon.)

Car Equipment. (For Fenders, Heaters, Registers, Wheels, etc., see those Headings.)

Car Lighting Fixtures.
Safety Car Heating & Lighting Co.

Car Stop, Automatic.
Consolidated Car-Heating Co.

Car Trimmings. (For Curtains, Doors, Seats, etc., see those Headings.)

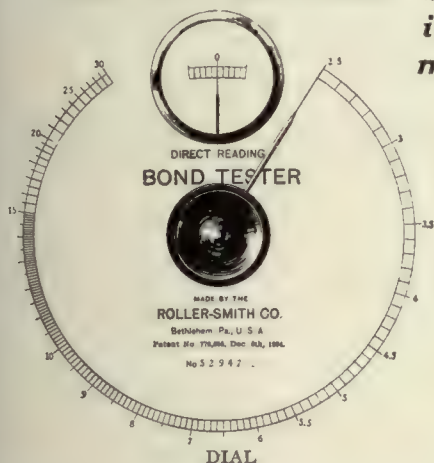
A New Bulletin ON Roller-Smith Bond Testers

has recently been issued and every man who has anything to do with the installation, care and testing of bonds should have a copy. It is yours for the asking. Bulletin No. 200 is the one to send for.

There are more Roller-Smith Bond Testers in use than all other makes combined.



BOND TESTER IN USE



Roller-Smith Company

233 BROADWAY, NEW YORK

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Monadnock Block

FACTORY
Bethlehem, Pa.

CLEVELAND
Williamson Bldg.



BALTIMORE.....Equitable Bldg.
BOSTON.....77 Franklin St.
DETROIT.....Majestic Building
KANSAS CITY.....600 East 15th St.
MINNEAPOLIS.....1st Nat.-Soo Line Bldg.
PHILADELPHIA.....Franklin Bank Bldg.
SAN FRANCISCO.....589 Howard St.
ST. LOUIS.....Railway Exchange Bldg.



TYPE C.

Insulator Clamps

For all purposes.

Splicing Sleeves

Of Seamless Copper (*Guaranteed*).

Protective Clamping Sets

(*Approved*).

For High Tension Crossings.

Write for information.

The Clark Electric and Manufacturing Company

Singer Building, New York



TYPE S.

OPEN CARS—10, 12, 14-BENCH SINGLE AND DOUBLE TRUCK CLOSED CARS

The Third Avenue Railway Company, New York City, have standardized on one type of car and have authorized us to sell their other types now in service, all of which are in excellent physical and operating condition. This is an advantageous time to make selection of your open cars for the coming season. Open cars increase your earning capacity and please the public. Also one 20' Wagon Single Truck Gasoline Electric Car, capacity 26 passengers, speed 20 miles per hour.

F. B. CUTTER COMPANY, Consulting Engineers

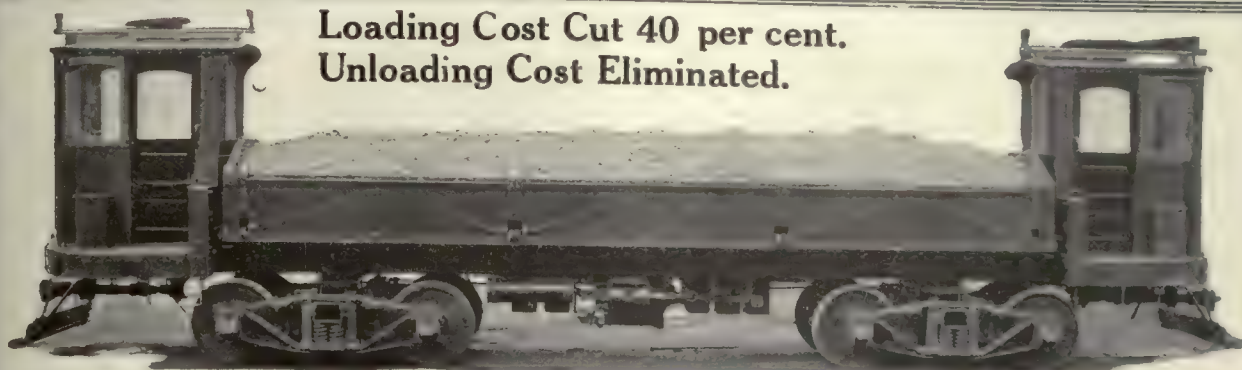
50 Church St., Hudson Terminal Bldg., New York

STEAM, GAS, ELECTRICAL MACHINERY, STREET CARS and STREET RAILWAY EQUIPMENT

Ready-Reference Index

to products manufactured by advertisers in this issue of Electric Railway Journal

- Cars, Passenger, Freight, Express, etc.**
American Car Co.
Brill Co., The J. G.
Cincinnati Car Co.
Jewett Car Co.
Kuhlman Car Co., G. C.
Laconia Car Co.
Pressed Steel Car Co.
St. Louis Car Co.
United Electric Car Co., Ltd.
Wason Mfg. Co.
Witt, Peter.
- Cars, Second Hand.**
Cutter Co., F. B.
Kerschner Co., Inc., W. R.
- Cars, Self-Propelled.**
*Allmänna Svenska Elektriska Aktiebolaget, Ltd.
*British Westinghouse Elec. & Mfg. Co.
Electric Storage Battery Co.
General Electric Co.
- Car, Trimmings.**
Dayton Mfg. Co.
- Cars, Dump.**
Differential Car Co.
- Castings, Brass.**
Frankel Connector Co.
More-Jones Brass & M. Co.
- Castings, Composition or Copper.**
Anderson M. Co., A. & J. M.
- Castings, Gray Iron and Steel.**
American B. S. & Fdry. Co.
American Bridge Co.
American Steel Foundries.
Bemis Car Truck Co.
Columbia M. W. & M. I. Co.
Hatch, Edwin G.
Laconia Car Co.
Long Co., E. G.
St. Louis Car Co.
St. Louis Steel Fdry.
Standard Steel Works Co.
Union Spring & Mfg. Co.
Wharton, Jr. & Co., Inc., Wm.
- Castings, Malleable and Brass.**
American Brake S. & Fdry. Co.
Bemis Car Truck Co.
Long Co., E. G.
St. Louis Car Co.
- Catchers and Retrievers, Trolley.**
Earl, C. I.
Electric Service Supplies Co.
Eclipse Railway Supply Co.
Holden & White.
Kerschner Co., Inc., W. R.
Long Co., E. G.
Lord Mfg. Co.
New Haven Trolley Supply Co.
Ohio Brass Co.
Union Electric Co.
Wood Co., C. N.
- Ceiling, Car.**
Keyes Products Co.
Fantasote Co., The.
- Chain & Belt Machinery.**
Beaumont Co., R. H.
- Chargers, Storage Battery.**
General Electric Co.
- Checks, Employees'.**
American Railway Supply Co.
- Cheese Cloth.**
Boyle & Co., Inc., John.
- Chemists.**
Little, Arthur D., Inc.
- Chimneys, Steel.**
*Babcock & Wilcox, Ltd.
- Circuit Breakers.**
*British Thomson Houston Co., Ltd.
*British Westinghouse Elec. & Mfg. Co., Ltd.
*Bruce Peebles & Co., Ltd.
Cutter Electrical & Mfg. Co.
Garton Co., W. R.
General Electric Co.
*Maschinenfabrik Oerlikon, Ltd.
Western Electric Co.
Westinghouse Elec. & M. Co.
- Clamps and Connectors, for Wires and Cables.**
Anderson Mfg. Co., A. & J. M.
Clark Electric & Mfg. Co.
Dossert & Co.
Electric Service Supplies Co.
Frankel Connector Co.
General Electric Co.
Klein & Sons, M.
Ohio Brass Co.
Standard Ry. Supply Co.
Western Electric Co.
Westinghouse Elec. & M. Co.
- Cleaners and Scrapers, Track. (See also Snow-Plows, Sweepers and Brooms.)**
Brill Co., The J. G.
Cincinnati Car Co.
Ohio Brass Co.
Root Spring Scraper Co.
Western Electric Co.
- Cleats, Car Wiring.**
General Electric Co.
- Cloth, Wiping & Lubricating.**
Sanitary Rag Co.
- Clusters and Sockets.**
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- Coasting Clocks.**
Railway Improvement Co.
- Coil Banding and Winding Machines.**
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Garton Co., W. R.
Kerschner Co., Inc., W. R.
Western Electric Co.
- Coils, Armature and Field.**
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D & W Fuse Co.
General Electric Co.
Independent Lamp & Wire Co.
Roebbing's Sons Co., John A.
Western Electric Co.
Westinghouse Elec. & M. Co.
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Electric Service Supplies Co.
General Electric Co.
Westinghouse Elec. & M. Co.
- Coin-Counting Machines.**
American Railways Equipment Co.
Electric Service Supplies Co.
International Register Co.
Johnson Fare Box Co.
- Commutator Slotters.**
Electric Service Supplies Co.
General Electric Co.
Westinghouse Elec. & M. Co.
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- Commutator Truing Devices.**
General Electric Co.
- Commutators or Parts.**
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Cameron Electrical Mfg. Co.
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Garton Co., R.
General Electric Co.
Long Co., E. G.
Mica Insulator Co.
Westinghouse Elec. & M. Co.
- Compressors, Air.**
Allis-Chalmers Mfg. Co.
Curtis & Co., Mfg. Co.
General Electric Co.
Westinghouse Trac. Brake Co.
- Condensers.**
Allis-Chalmers Mfg. Co.
General Electric Co.
Westinghouse Elec. & M. Co.
- Conduits, Flexible.**
Tubular Woven Fabric Co.
- Conduits, Underground.**
Johns-Manville Co., H. W.
Western Electric Co.
- Connectors, Solderless.**
Frankel Connector Co.
- Controller Fingers.**
Lord Mfg. Co.
- Controller Handles.**
Lord Mfg. Co.
- Controller Regulators.**
*Electric Service Supplies Co.
- Controllers or Parts.**
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*British Westinghouse Elec. & Mfg. Co.
*British Thomson Houston Co., Ltd.
*Bruce Peebles & Co., Ltd.
Columbia M. W. & M. I. Co.
Electric Service Supplies Co.
General Electric Co.
Johns-Manville Co., H. W.
Kerschner Co., Inc., W. R.
*Maschinenfabrik Oerlikon
Westinghouse Elec. & M. Co.
- Controlling Systems.**
*British Thomson Houston Co., Ltd.
*Bruce Peebles & Co., Ltd.
General Electric Co.
*Maschinenfabrik Oerlikon, Ltd.
Westinghouse Elec. & M. Co.
- Converters, Rotary.**
Allis-Chalmers Mfg. Co.
General Electric Co.
Western Electric Co.
Westinghouse Elec. & M. Co.
- Conveying and Hoisting Machinery.**
American Bridge Co.
*Babcock & Wilcox, Ltd.
Beaumont Co., R. H.
Green Eng'g Co.
Hunt Co., C. W.
- Cooling Systems.**
Spray Engineering Co.
- Cord, Bell, Trolley, Register, etc.**
Brill Co., The J. G.
Electric Service Supplies Co.
Garton Co., W. R.
International Register Co.
Long Co., E. G.
Roebbing's Sons Co., John A.
Samson Cordage Works.
Silver Lake Co.
- Cord Connectors and Couplers.**
Electric Service Supplies Co.
Samson Cordage Works.
Wood Co., C. N.
- Cotton Duck.**
Boyle & Co., Inc., John.
- Couplers, Car.**
Brill Co., The J. G.
Cincinnati Car Co.
Long Co., E. G.
Ohio Brass Co.
Van Dorn Coupler Co.
Westinghouse Trac. Brake Co.
- Cranes. (See also Hoists.)**
Allis-Chalmers Mfg. Co.
Beaumont Co., R. H.
*Babcock & Wilcox, Ltd.
Niles-Bement-Pond Co.
- Cresosoting. (See Wood Preservatives.)**
- Cross Arms. (See Brackets.)**
- Crossing Foundations.**
International Steel Tie Co.
- Crossing Signals. (See Signals, Crossing.)**
- Crossings, Track. (See Track, Special Work.)**
- Culverts.**
American Rolling Mill Co.
Bark River B. & Culvert Co.
California Cor. Culvert Co.
Canton Culvert & Silo Co.
Coast Culvert & Flume Co.
Corrugated Culvert Co.
Delaware Metal Culvert Co.
Dixie Culvert & Metal Co.
Hardesty Mfg. Co., R.
Illinois Corrugated Metal Co.
Independence Co. Culvert Co.
Iowa Pure Iron Culvert Co.
Kentucky Culvert Mfg. Co.
Lee-Arnett Co.
Lone Star Culvert Co.
Lyle Corrugated Culvert Co.
Michigan Bridge & Pipe Co.
Montana Culvert Co.
Nebraska Culvert & Mfg. Co.
Nevada Metal Mfg. Co.
New England Metal Cul. Co.
North East Metal Co.
Northwestern Sheet & I. Wks.
O'Neill Co., W. G.
Ohio Corrugated Culvert Co.
Pennsylvania Metal Cul. Co.
Road Supply & Metal Co.
Sioux Falls Metal Cul. Co.
Spencer, J. N.
Spokane Corr. Cul. Co.
Tennessee Metal Culvert Co.
Utah Corr. Culvert & Flume Co.
Virginia Metal & Culvert Co.
Western Metal Mfg. Co.
Wyatt Mfg. Co.
- Curtains and Curtain Fixtures.**
Acme Supply Co.
Brill Co., The J. G.
Curtain Supply Co.
Edwards Co., Inc., The O. M.
Electric Service Supplies Co.
Hartshorn Company, Stewart.
Fantasote Co., The.
St. Louis Car Co.
- Cutting Apparatus, Oxy-Acetylene.**
Davis-Bournonville Co.
Oxweld Acetylene Co.
Prest-O-Lite Co., The.
- Derailing Devices.**
Cleveland Frog & Crossing Co.
Wharton, Jr., & Co., Inc., Wm.



This car belongs to the East Liverpool Traction and Lt. Co., East Liverpool, Ohio

It's easy to **waste** money by handling stone, sand, gravel, slag, cinders, coal and similar bulk materials in ordinary cars. But it's still easier to **save** money by handling those same materials in the

DIFFERENTIAL ELECTRIC DUMPING CAR

The load is dumped clear of the track without being touched by a shovel. The motorman alone can discharge the load and get out of the way of passenger traffic without bringing his car to a full stop. A motorman and conductor, operating a train of three Differential Cars, transport and discharge in two hours as much material as seven flat cars previously did in ten hours. It cost more than \$5,000 per year, direct labor, to unload the flat cars. It costs practically nothing to unload the Differential Cars. This has been proved by the Cleveland Railway Company.

The Differential is electrically dumped and the tilt-

ing body is under the control of the operator in all positions. The car may be loaded while in tilted position and then moved to central position for transporting the load. The loading height in this case is less than three feet above the rail. Even in upright position it is two feet lower than other cars. The maximum height of the sideboards is only 5' 4½" on 24" truck wheels—that cuts the shovelers' work 40%.

Your way department needs one or more Differentials right now. Write today for detailed information. See working model at Exhibit No. 500.

Differential Car Company

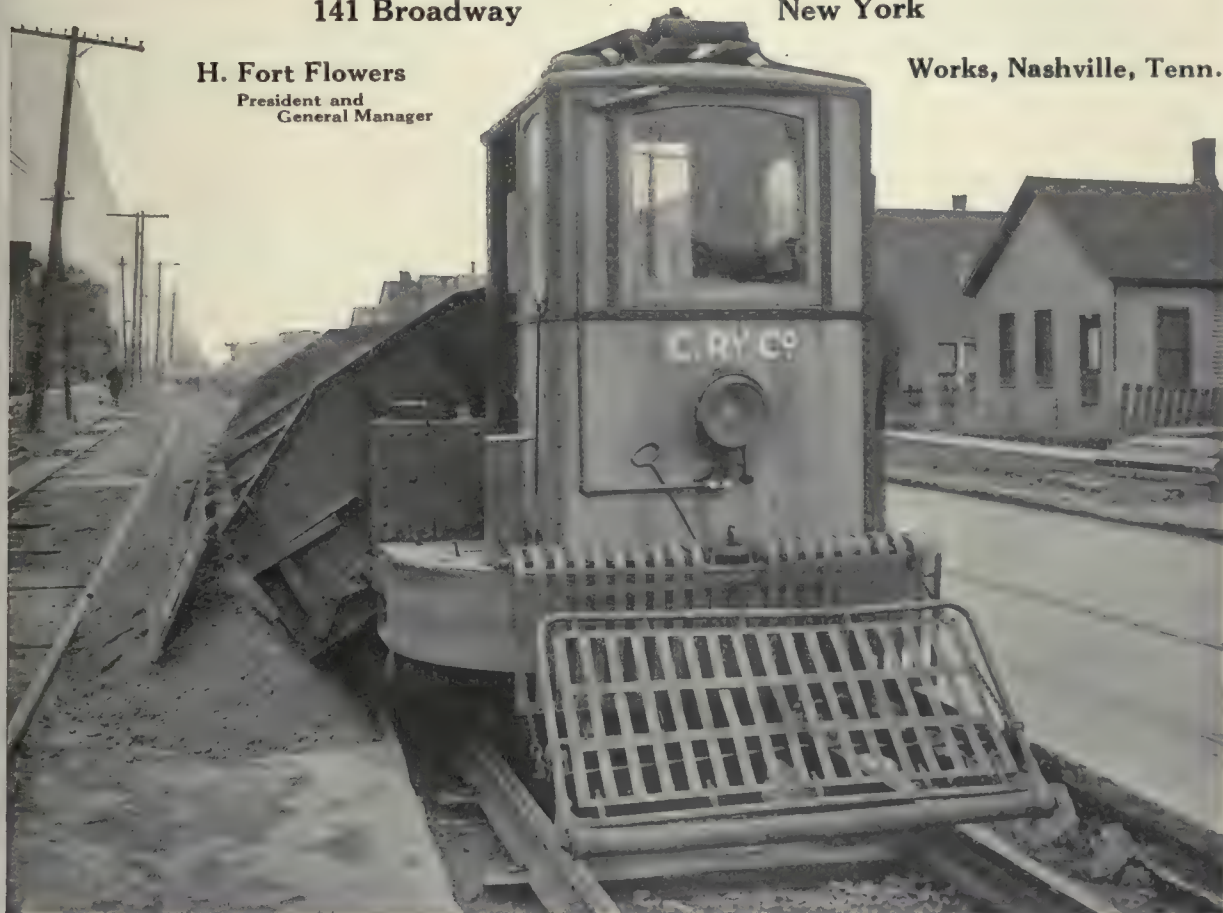
141 Broadway

New York

H. Fort Flowers

President and
General Manager

Works, Nashville, Tenn.



Ready-Reference Index

to products manufactured by advertisers in this issue of Electric Railway Journal

Destination Signs.

Columbia M. W. & M. I. Co.
Electric Service Supplies Co.
Western Electric Co.

Detective Service.

Wisch Service, P. Edward.

Dispatching Systems.

Simmens Auto Ry. Sig. Co.
Western Electric Co.

Doors, Asbestos.

Johns-Manville Co., H. W.

Door Operating Devices.

Consolidated Car-Heating Co.
National Pneumatic Co.

Doors and Door Fixtures.

Brill Co., The J. G.
Edwards Co., Inc., The O. M.
Hale & Kilburn Co.
National Pneumatic Co.

Doors, Folding Vestibule.

National Pneumatic Co.

Doors, Steel.

Acme Supply Co.

Doors, Trap.

Edwards Co., Inc., The O. M.

Draft Rigging. (See Couplers, Car.)

Drills, Track.

American Steel & Wire Co.
Electric Service Supplies Co.
Long Co., E. G.
Ohio Brass Co.

Dryers, Sand.

Electric Service Supplies Co.
Zelnicker Company, W. A.

Economizers.

*Babcock & Wilcox, Ltd.

Engineers, Consulting, Contracting and Operating.

Archbold-Brady Co.
Arnold Co., The.
Burch, Edward P.
Byllesby & Co., H. M.
Ford, Bacon & Davis.
Gulick-Henderson Co.
Hatch, Edwin G.
Hunt & Co., Robert W.
Jackson, D. C. & Wm. B.
Little, Arthur D., Inc.
Neller, Rich & Co.
Richey, Albert S.
Roosevelt & Thompson.
Sanderson & Porter.
Sargent & Lundy.
Schofield Engineering Co.
Stone & Webster Eng'g Corp.
Westinghouse Church Kerr & Co.
White Companies, The J. G.
Woodmansee & Davidson, Inc.

Engines, Gas and Oil.

Allis-Chalmers Mfg. Co.
*Belliss & Morcom, Ltd.
Westinghouse Elec. & M. Co.

Engines, Steam.

Allis-Chalmers Mfg. Co.
Westinghouse Elec. & M. Co.

Fare Boxes.

American Rys. Equipment Co.
Brill Co., The J. G.
Cleveland Fare Box Co.
Dayton Fare Recorder Co.
International Register Co., The
Johnson Fare Box Co.
Ohmer Fare Register Co.

Feed Water Heaters.

*Babcock & Wilcox, Ltd.

Fences, Woven Wire, and Fence Posts.

American Steel & Wire Co.

Fencing, Wire.

American Steel & Wire Co.
Page Woven Wire Fence Co.

Fenders and Wheel Guards.

Brill Co., The J. G.
Cincinnati Car Co.
Cleveland Fare Box Co.
Consolidated Car Fender Co.
Eclipse Railway Supply Co.
Electric Service Supplies Co.
Lord Mfg. Co.
Root Spring Scraper Co.
Star Brass Works.
Western Electric Co.

Fibre.

Diamond State Fibre Co.
Johns-Manville Co., H. W.
Westinghouse Elec. & M. Co.

Fibre Tubing.

Diamond State Fibre Co.
Johns-Manville Co., H. W.
Westinghouse Elec. & M. Co.

Fibre Insulation.

Johns-Manville Co., H. W.
U. S. Metal & Mfg. Co.

Field Colls. (See Colls.)

Fire Extinguishing Apparatus.

Johns-Manville Co., H. W.

Fire-Proofing Material.

Johns-Manville Co., H. W.
Keasbey & Mattison Co.

Flooring, Composition.

Acme Supply Co.
American Mason Safety T. Co.
Johns-Manville Co., H. W.
Western Electric Co.

Forgings.

Columbia M. W. & M. I. Co.
Laconia Car Co.
Standard Steel Works Co.
Steel Car Forge Co.
Valley Steel Co.

Furnaces. (See Stokers.)

Furniture, Metal, Office.

Edwards Co., Inc., The O. M.

Fuses and Fuse Boxes.

Columbia M. W. & M. I. Co.
D & W Fuse Co.
Daum, A. F.
General Electric Co.
Johns-Manville Co., H. W.
Western Electric Co.
Westinghouse Elec. & M. Co.

Fuses, Refillable.

Columbia M. W. & M. I. Co.
Economy Fuse Mfg. Co.
General Electric Co.
Johns-Manville Co., H. W.

Gages, Oil and Water.

Ohio Brass Co.

Gaskets.

Diamond State Fibre Co.
Johns-Manville Co., H. W.
Power Specialty Co.

Gas-Electric Cars.

*Allmanna Svenska Elektriska Aktiebolaget.
*British Westinghouse Elect. & Mfg. Co., Ltd.
General Electric Co.

Gas Producers.

Westinghouse Elec. & M. Co.

Gates, Car.

Brill Co., The J. G.
Cincinnati Car Co.
Jewett Car Co.

Gear Blanks.

Carnegie Steel Co.
Diamond State Fibre Co.
Standard Steel Wks. Co.

Gear Cases.

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Registers full passenger load on trip—passenger counter and the total registrations on total-passenger counter.

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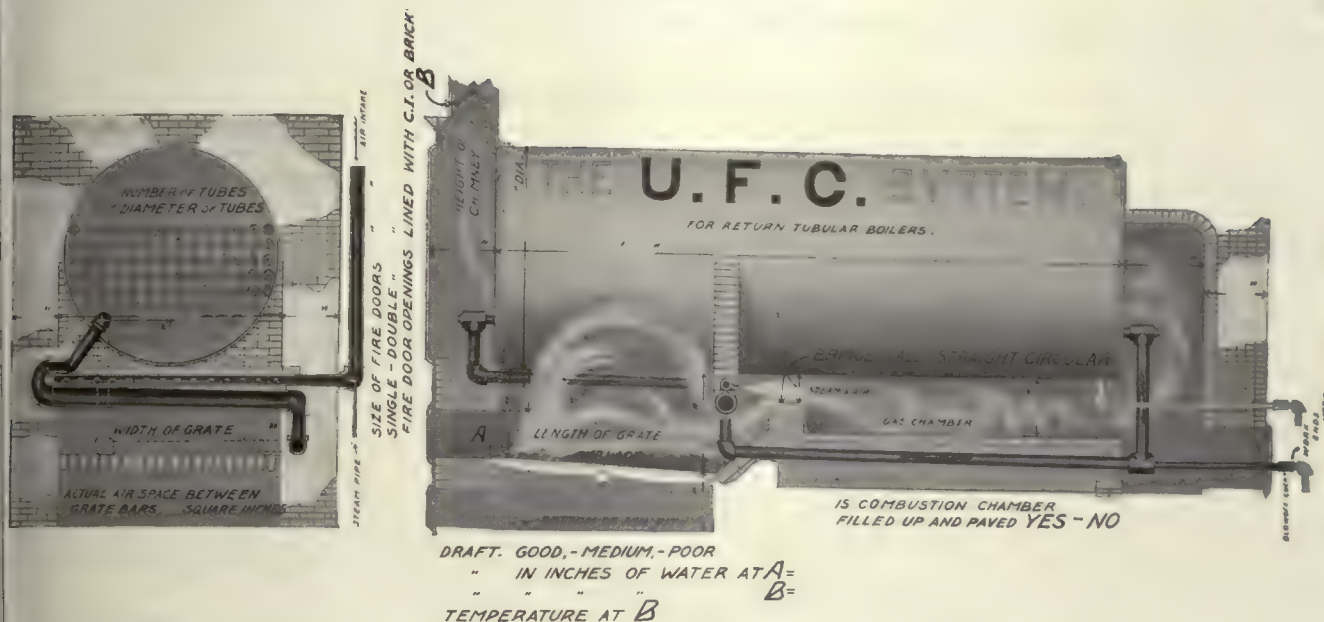
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For Raising Boiler Efficiency

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We Guarantee for Return Tubular Boilers

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- (c) Boiler furnace rendered smokeless under city ordinance when using bituminous coal.

The following table gives the mean results of fifty boilers tested by the owners or purchasers:

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Cost of coal per ton.....	\$3.56	\$3.56
Coal per horse power hr..	4.137 lb.	3.12 lb.
Per cent of ashes.....	15.81	13.61
Efficiency (B.T.U. utilized)	62.23	80.22
HP on basis 34½ lb. coal per hour from and at 212 deg.	111.82	135.77
Cost of evaporating 1000 lb. water from and at 212 deg.	20.79c	14.63c

Thus giving the following average results:

22.63% of coal saved with the U.F.C. System
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Write us for full particulars, names of users and copies of their test sheets.

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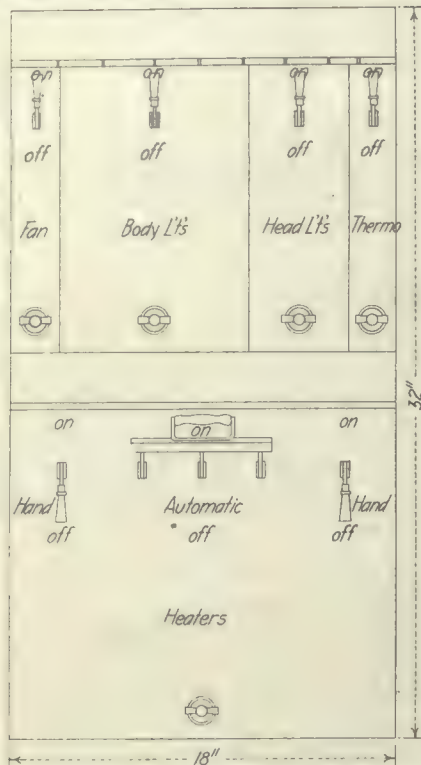
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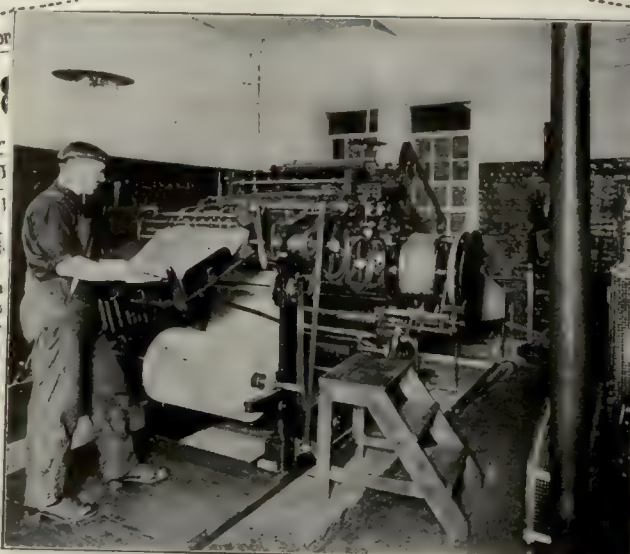
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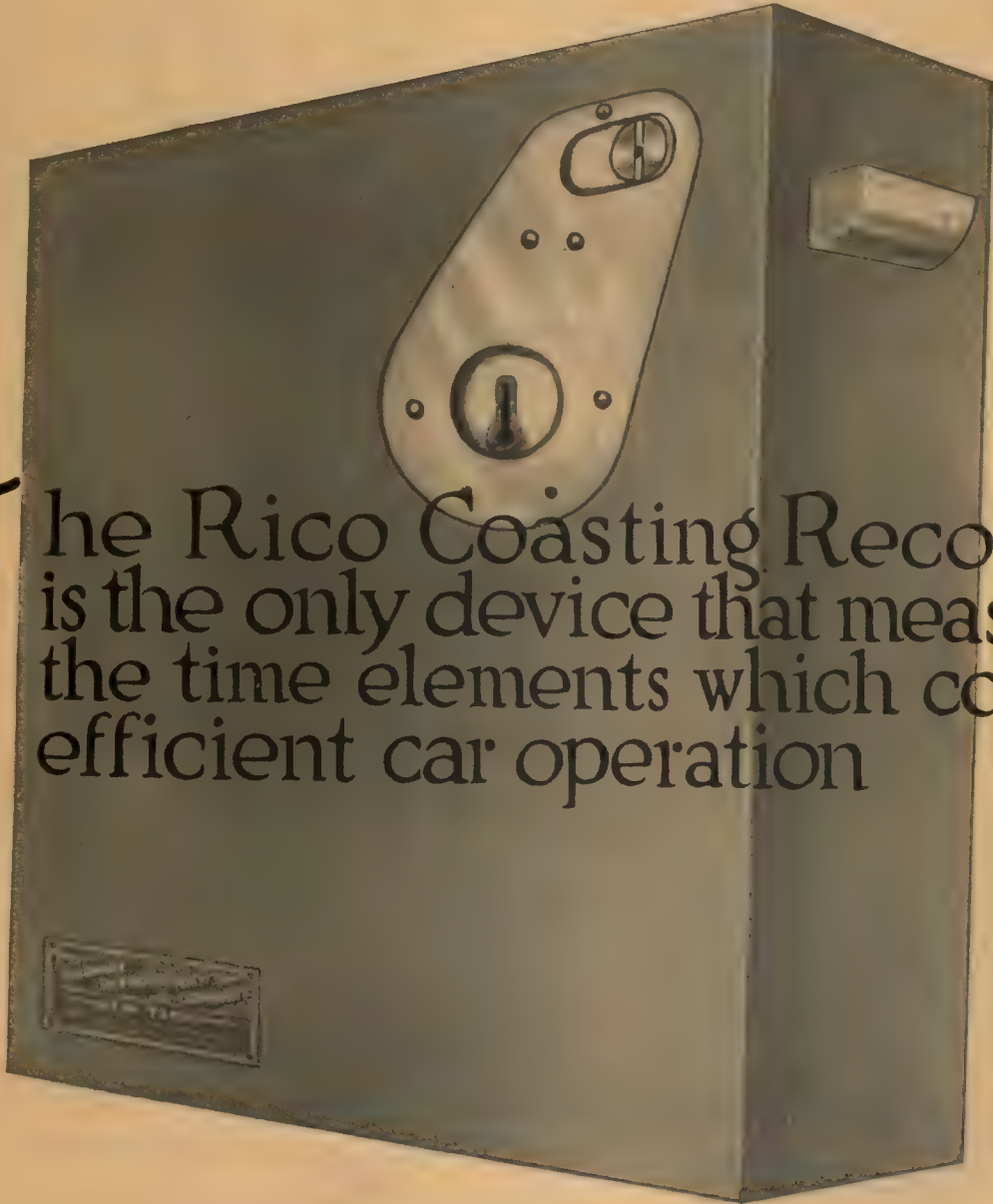
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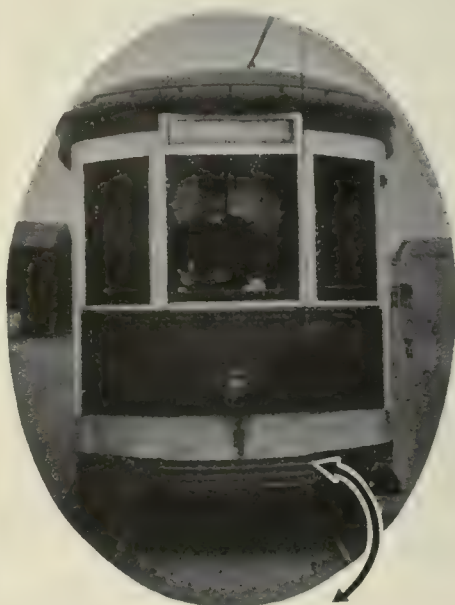
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Section

1

Track

THIS section is devoted to advertisements of the essentials of the complete roadbed, both city and interurban—

The Purified Rail

The Steel Tie

The Steel Crossing Foundation

Culverts

Joints and Bonds in Various Forms

Every Class of Special Work

Switch Stands and Various Details

And a line of construction and maintenance tools such as

Shovels

Grinders

Welders and

Pneumatic Tampers

Wyoming Mayari Red Edge Shovels

THE Electric Railways of the Country have responded more whole-heartedly perhaps to this common sense development than any other industry—or at least they responded a little quicker.

Why?

Because the Traction Field has undergone so many changes—it has developed so rapidly that unless its engineers have the vision to see *at once* the possibilities or otherwise of new devices, they are left far behind by the Progressive.

It has surely been a race of the Sure and Swift. That is why the practically Country-wide adoption of Wyoming Mayari Red Edge Shovels by the Electric Railways is particularly gratifying to us.

We have had to earn it and have enjoyed earning it—but we were given the chance, and superiority was recognized and rewarded.

Wyoming Mayari Red Edge Shovels will produce Economy and Efficiency. These two results are guaranteed.

We have some interesting figures for distribution; also a new Red Edge Catalog.



The Wyoming Shovel Works, *Wyoming, Pa.*



The Car Is Important But Consider the Track



The car is your revenue producer and it is right that it should be as the apple of your eye.

But consider how much more your car can do for you if you give it the chance to earn maximum revenue.

Maximum revenue is possible only if your rails give smooth service and long service.

You spend so much to tear up and replace outworn track, and you lose so much in fares during its reconstruction—

That you will be compensated many times over if you minimize such losses by specifying

Titanium-treated Rails for Your Standard Sections

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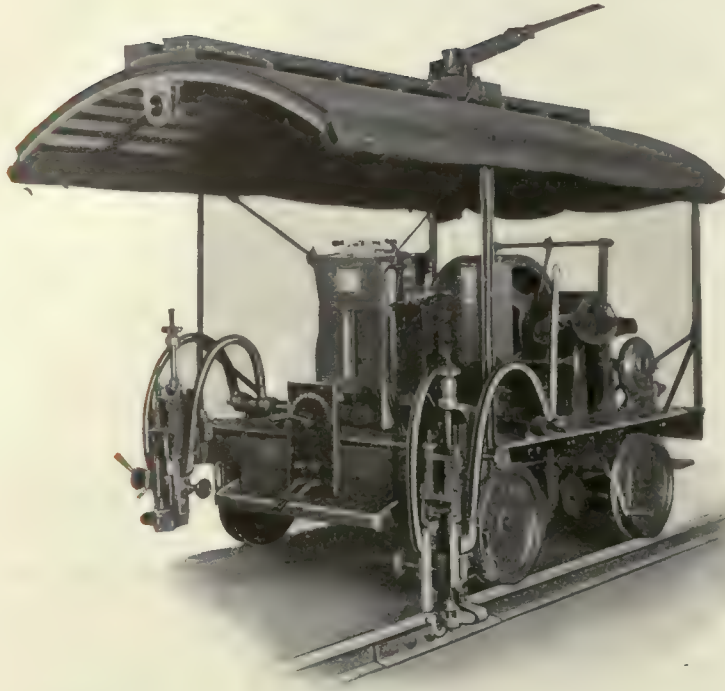


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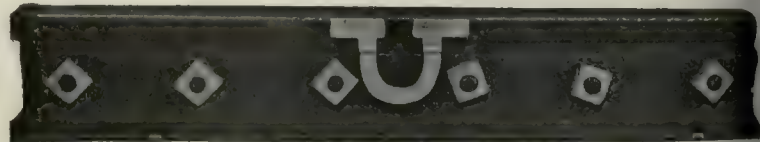
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**See exhibit at space 558 to 564 at Atlantic
City Convention**

This car is self propelled and goes anywhere on your track for general bonding work. It is a complete bonding unit, carrying tools, supplies and men. It can be readily removed from the track to allow passage of cars.

Erico Welded Bonds

**Do not corrode at the terminals
Give full 8 to 1 ratio copper
to steel**



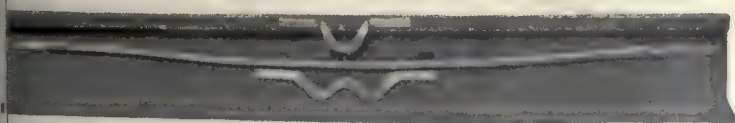
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Cleveland, Ohio

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This motor truck is specially designed for bonding in city streets without interrupting traffic. It carries a complete set of tools and supplies as well as the bonding gang. Bonds can be installed while cars are passing.



Champion Brazed Bonds

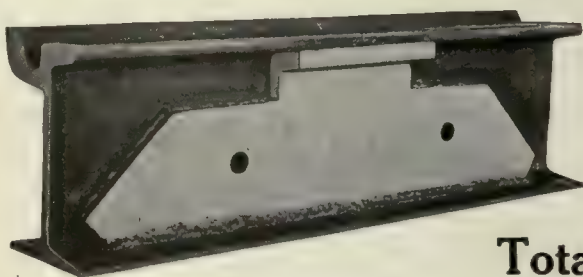
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The Electric Railway Improvement Co.
Cleveland, Ohio



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The Indianapolis Port



The "Apex" Joint

Total Cost Installed \$4 to \$5 per Joint

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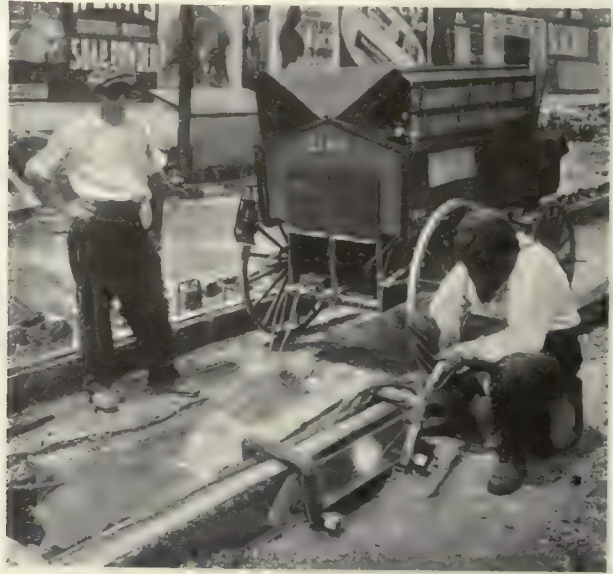
Indianapolis Switch

New York



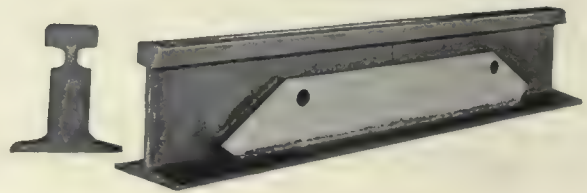
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on the Wall Answer



able Electric Welder

The "Simplex" Joint



Total Cost Installed \$3 to \$4 per Joint

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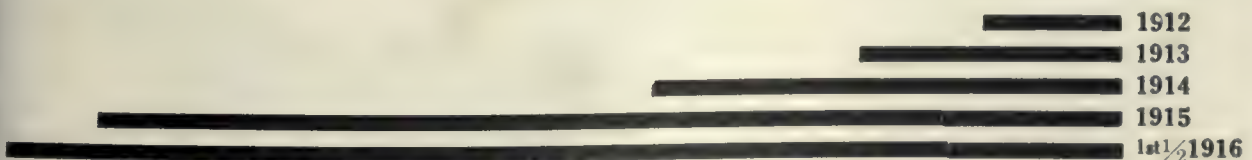
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Chicago



Comparative Sales of Indianapolis Electrically Welded Joints

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POWER HOUSE



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Market Has as
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For Electric
Contact*

**For
All-Around
Service
American Twin
Terminal Bonds
are Unsurpassed**

One man — a light drill and a few Twin Terminal Bonds complete the outfit for pick-up work.

The joint need not be disturbed. The Bonds are in plain sight and can be inspected easily.



*The Horseshoe
Shape has proven
to have the longest
mechanical life
under heavy and
continuous
vibration*

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For Station Wiring, Arc Light and Signal Service and High Voltage Power Transmission Lines, A. S. & W. Co.'s rubber-covered wires and cables will insure long life and low ultimate cost.

Made to the most exacting specifications, they are furnished in any size or finish for all services and voltages.

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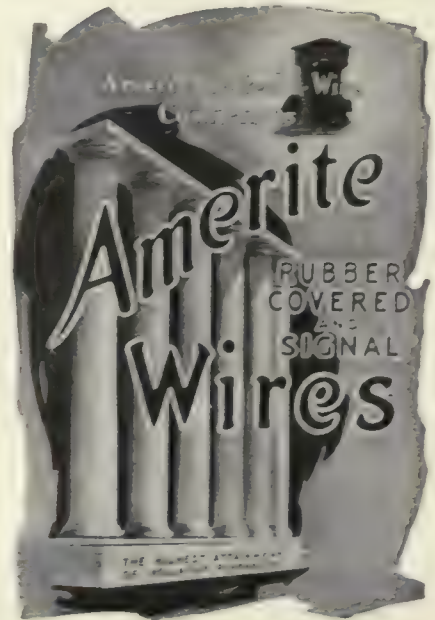
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*Of decidedly practical
and technical value to
engineers and operators*



INTERNATIONAL



Track in Bath, Pa., Built by Allen Street Railway Co., Nazareth, Pa.

Steel Twin Ties

Not substitutes for wooden ties—but successors to wooden ties. They have the bearing, resiliency and holding power of wood while combining tie-rod and rail chair advantages.

This design is simplicity itself—two 3-in. transverse channels spaced 3 ft. apart, and at each end a 13-in. x $\frac{5}{16}$ -in. plate 3 ft. long, riveted to the top of the channel and lying lengthwise under the rail.

The bent down edges of the plate cause a truss action between the channels which strengthens the whole tie, and they assure maximum bearing surface because they retain the stone or concrete which has been tamped under them from either side of the rail. The plate lies directly under the rail and transmits all stresses from the rail to the foundation. The clip holds the rail base so firmly that the rails keep to gage as readily as with tie rods or chairs, and they are brought to gage during construction

by the accurate punching of the holes in the plates.

International Steel Twin Ties effect big savings in pavement and excavation due to the shallower type of construction compared to wooden tie track.

The maintenance and ultimate costs of these ties are also less than wood because of their very slow deterioration and ability to withstand mechanical injury.

And don't forget in reconstructing track that International Steel Twin Ties can be laid on the undisturbed concrete foundation from which worn-out wooden tie track has been removed.

Isn't it a noteworthy fact that with one exception every member of the A. E. R. A. Way Committee (men who study the efficiency and economy of track devices) uses International Steel Twin Ties?

A short note from you will bring details.

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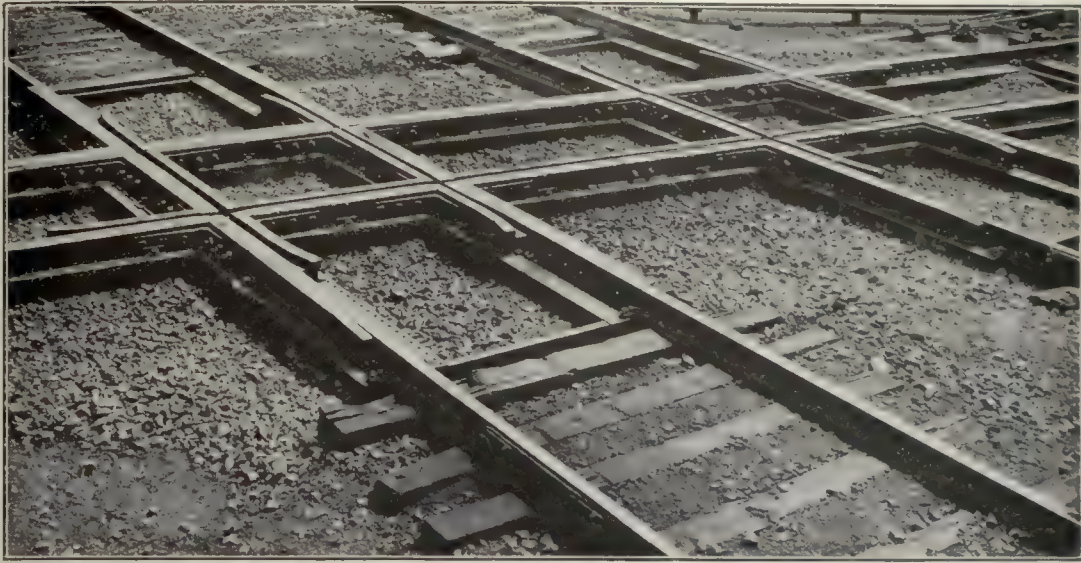
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Minneapolis, Minn.

INTERNATIONAL



C. C. C. & St. L. R.R. and Wheeling & Lake Erie Crossing Laid on International Steel Crossing Foundations

Steel Crossing Foundations

Under new crossings will more than double their life and greatly decrease maintenance costs,

Under old, worn and loose built-up crossings will greatly extend their life and quickly save the foundation's cost in maintenance charges.

The two intersection built-up crossing illustrated was badly worn and could be kept in service only by constant attention at the time our steel foundation was placed under it early this year.

It is now so well supported that heavy high-speed team traffic on both roads passes smoothly, quietly and with perfect safety. The crossings themselves are wearing into better surface than they have been since they were new and there has been no maintenance cost.

These foundation sections are closed steel box girders with six-inch channel sides and five-sixteenths-inch plates top and bottom, with the box filled with tightly fitted creosoted wooden blocks placed crosswise.

The severest traffic conditions cannot injure this steel box girder or its wood block filler.

Support your crossings, new or old, on INTERNATIONAL STEEL CROSSING FOUNDATIONS, and save money.

They are inexpensive and easy to install. Send us blueprints of your crossings and let us submit quotations.

Shipment in Three Weeks.

The International Steel Tie Company

General Sales Office and Works: Cleveland, Ohio

REPRESENTATIVES

Western Eng'g Sales Co., San Francisco, Cal.,
Los Angeles, Cal., Seattle, Wash.

R. J. Cooper Co.,
Salt Lake City, Utah.

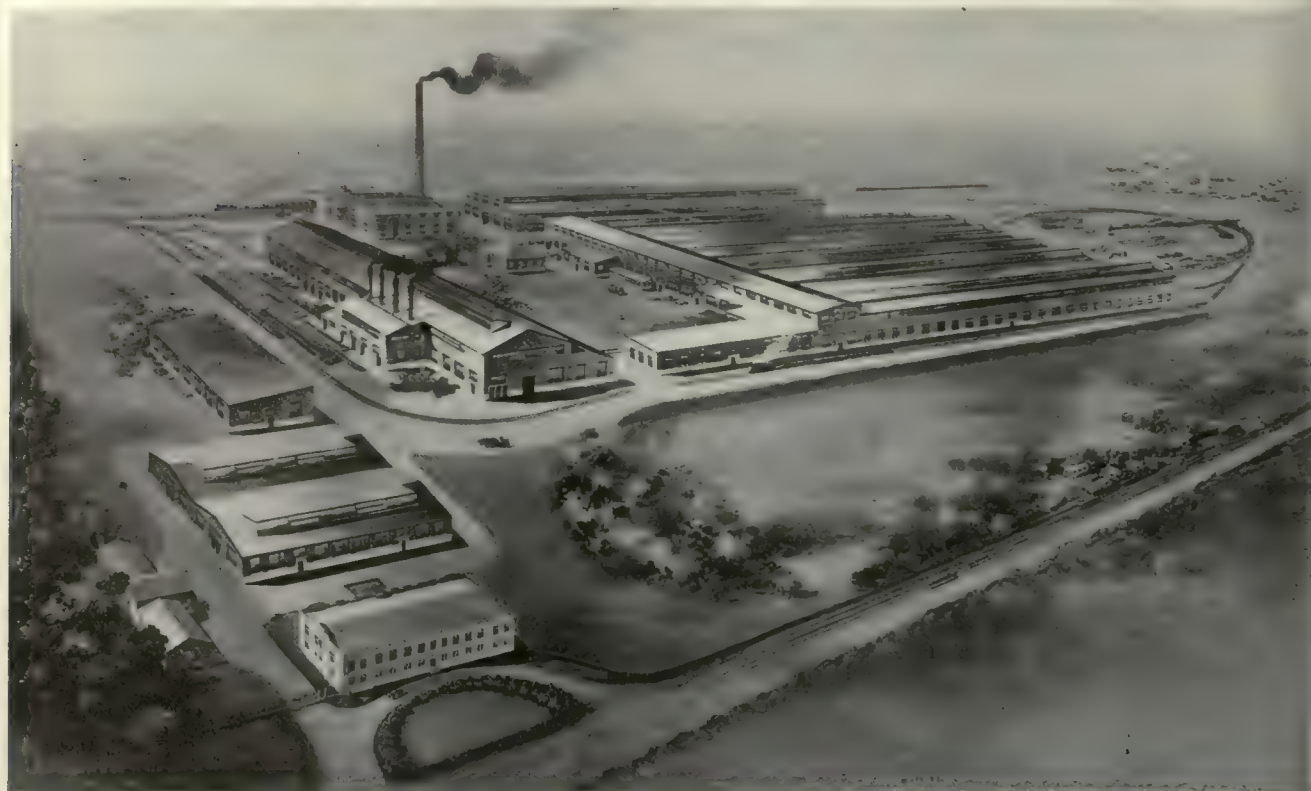
J. E. Lewis & Co.,
Dallas, Texas.

Maurice Iov,
Philadelphia

William H. Ziegler,
Minneapolis, Minn.

WHARTON SPECIAL TRACK WORK

OF SUPERIOR DESIGNS
FOR ALL CLASSES OF SERVICE



NEW WORKS AT EASTON, PENNA.

The most modern and fully equipped
plant in this country for the
production of

SPECIAL TRACK WORK

For Electric and Steam Railways.

TISCO
MANGANESE
STEEL
TRACK WORK
IS OUR SPECIALTY

WM. WHARTON JR. & CO.
INCORPORATED
EASTON, PENNA.

Bethlehem Steel Company

South Bethlehem, Pa.

Has Purchased all the Properties of

The Pennsylvania Steel Company

THE FROG AND SWITCH DEPARTMENT

STEELTON, PA.

will be enlarged and improved.
This department will continue
the largest manufacturer of

Special Track Work and Frogs, Switches and Crossings

GENERAL OFFICES:

South Bethlehem, Pa.

DISTRICT SALES OFFICES:

Boston, Mass.....Oliver Building
New York, N. Y.....111 Broadway
Philadelphia, Pa.....Morris Building
Baltimore, Md.....Continental Building
Pittsburgh, Pa.....1st Nat'l Bank Bldg.

Cleveland, O.....New Guardian Bldg.
Detroit, Mich.....Penobscot Bldg.
Chicago, Ill.....Peoples Gas Building
St. Louis, Mo.....Boatmen's Bank Bldg.
San Francisco, Cal.....Crocker Bldg.

Barbour, Stockwell Co.

Established 1858

205 Broadway, Cambridge, Mass.

Manufacturers of
High Grade Special Work for Street Railways



Superior
Switches, Mates, Frogs and Crossings

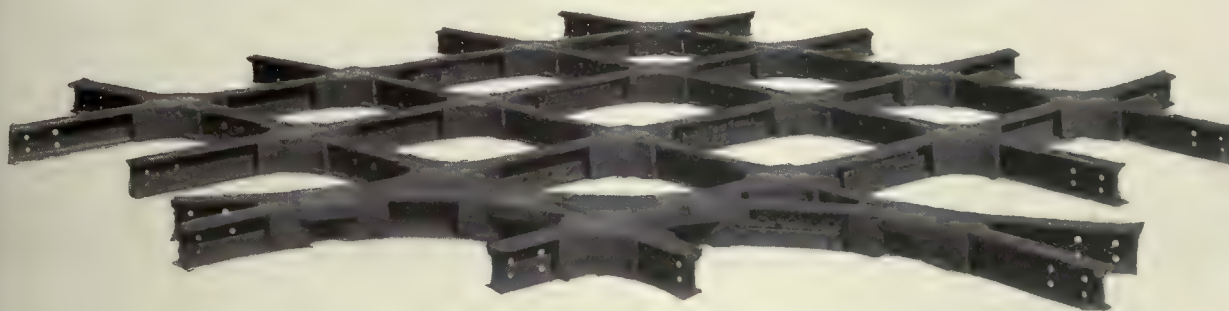
Turnouts and Cross Connections
Kerwin Portable Crossovers

Estimates promptly furnished

SPECIAL TRACK WORK

**Switches Mates Frogs Crossings
and Complete Layouts**

Hard Center—Manganese Insert—and Solid Manganese Construction



Note that six of the frogs in the above crossing
were cast in one piece



Improved Anti-Straddle Tongue Switch

Pinless Tongue—Heavily Reinforced—100% bearing efficiency

Held positively by beveled end in Solid Manganese pocket.

Wear between tongue and bed is reduced to a minimum.

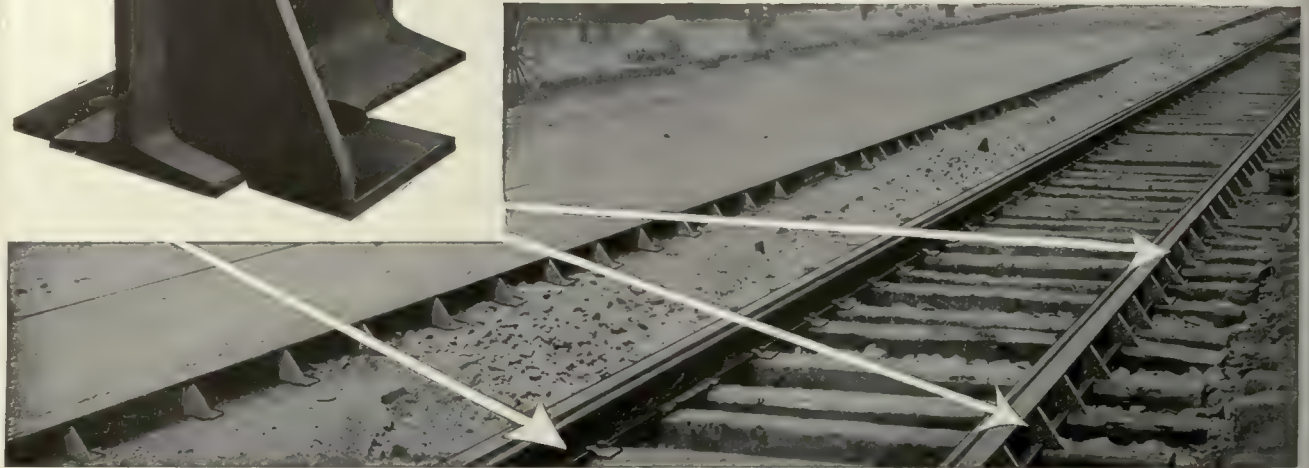
Avoid Accidents by using this Switch—Car cannot straddle Tongue.

NEW YORK SWITCH AND CROSSING CO.

Hoboken, N. J.



A Big Saving In Track Paving



Tie Plate

Rail Brace

At least 30% of the total expenditure affecting street railway maintenance is due to pavement in the tracks. You can realize what this means when upward of \$40,000,000 is spent annually in the United States alone in maintaining track.

We believe you will agree with W. M. Archibald, Engineer of Way, Houston (Tex.) Electric Company, when he says, "The more nearly the entire paving approaches the condition of a solid block, the better will it wear and the less maintenance work will be necessary on it."

The Combination Rail Brace and Tie-Plate

makes paving most nearly "approach the condition of a solid block" by eliminating the trouble-making tie-rod, and holding the track rigid to gage.

It means big savings in track laying, track paving and maintenance.

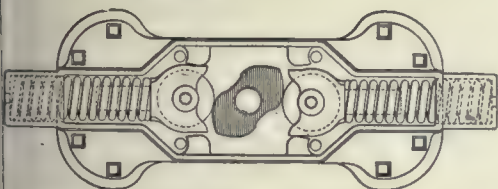
Ask Us How Much It Will Save and Why

Steel Car Forge Company
Pittsburgh New York Chicago

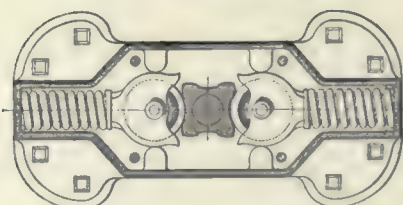
Works: Ellwood City, Pa., and Hammond, Ind.

Ramapo

Automatic Patent Safety Switch Stands for
Interurban Service



Ramapo Pat. Automatic Return Switch Stand No. 37,
Showing Mechanism Half-Thrown Automatically



Ramapo Patent Safety Switch Stand Style No. 17,
Showing Automatic Mechanism

These Switch Stands Also Furnished in Medium Heights and Dwarf Styles

T-RAIL SPECIAL WORK

FOR

Private Rights-of-way and Interurban Lines
Manganese Construction—All Styles

Street and Steam Crossings a Specialty

Write for catalogue and details

Ramapo Iron Works, Hillburn, N. Y.

Main Office, Hillburn, N. Y.

New York: 30 Church St.

Plants: Hillburn and Niagara Falls

The Lincoln Rail Bonder

Has No Peer



At the A. E. R. A. Convention— Look for us on the Pier

Ask us about Costs of welding the Lincoln way.

Ask us about the ease of handling Lincoln Apparatus.

Ask us about the Efficiency of the Lincoln bond.

Let us prove at our Demonstration on the pier all we say
about our system of bonding.

Let us show you the bonder that weighs but 400 lb. and measures but 16 in. in outside diameter and 24 in. in length. The bonder that is in a class by itself in such advantages as portability, compactness and lightness. Let us show you with what rapidity even unskilled operators can install the U shaped, laminated Lincoln Bond without drilling the rail or affecting its crystalline structure.

Jot down the questions you want to ask us on the pier.

The Lincoln Bonding Company

636 Huron Road
CLEVELAND, OHIO

AGENTS:

LEWIS & ROTH COMPANY
311 Denckla Bldg., Philadelphia, Pa.
114 Liberty Street, New York City, N. Y.
CHARLES N. WOOD COMPANY
79 Milk Street, Boston, Mass.





Here's One Proof!

Here at San Antonio, a system of 81.5 single-track miles and more than 5000 Thermit Insert Welds, the ideal in track maintenance has been attained.

That ideal is not to keep the way department pottering permanently at the rail joint repairs, but to eliminate the joint so that

An Uninterrupted Rail Will Give Uninterrupted Service

The first Thermit Insert Welds of San Antonio were made in October 1913, and additional welds are being installed now.

Can you realize fully the importance of the fact that only two

Thermit Insert Welds have been reported as broken—one in special work and one on a bridge approach?

San Antonio knows no costly repairing or troublesome rerouting for

The Thermit Insert Weld Has Practically Ended Broken Joints!

GOLDSCHMIDT THERMIT CO.

120 BROADWAY, NEW YORK

329-333 Folsom St., San Francisco

103 Richmond St., W., Toronto, Ont.

7300 So. Chicago Ave., Chicago





Greater Permanence of Road Bed — EASIER RIDING TRACK — AT A LOWER COST PER MILE

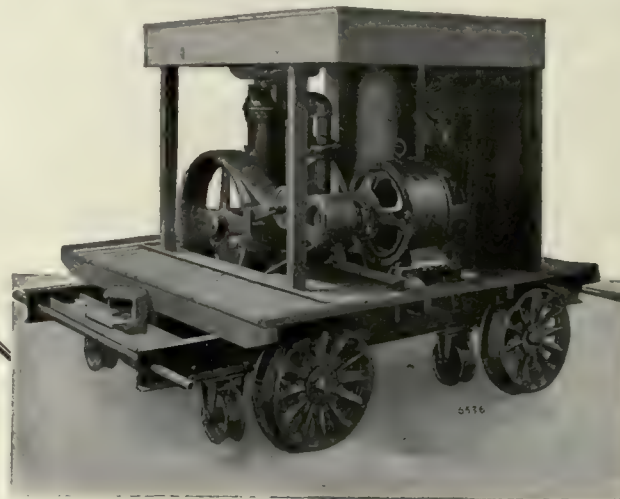
These are the problems for which the electric railway master mechanic has long sought a solution.

An "Imperial" Tamping Outfit at work on the United Traction Co., Albany, N. Y.

"IMPERIAL" TIE TAMPERS

have demonstrated their ability to effect these improvements.

They have been made a part of the permanent track maintenance equipment of many of the large electric railway lines of the country.



"Imperial" Tie Tampers will work effectively with any kind of ballast—on straight track, curves, switches, crossovers, etc.

"Imperial" Tie Tampers are pneumatically operated by air from a special Compressor Car. This ordinarily takes its power from the trolley circuit, but a gasoline motor driven outfit can be supplied when wanted.

BULLETIN 9023 contains interesting data on the subject of pneumatic track tamping.

We will be glad to
send a copy on request.

INGERSOLL-RAND COMPANY

11 Broadway
NEW YORK

Offices the World Over

165 Q. Victoria St.
LONDON

28 TT



On the Twin City Lines at Minneapolis, Minn., it has been demonstrated that the "Imperial" Tie Tamper can be efficiently operated by one who is handicapped by the loss of an arm.



EFFICIENT TRACK GRINDING Cuts Car Repair Costs

Every railway man knows of course that uneven track caused by cupped joints or rail corrugations is detrimental to cars.

It is doubtful, however, if many railways

have any definite data as to the extent to which this is true.

It is our belief that the compilation of such data would clearly show that from this standpoint *alone* the use of the

Reciprocating Track Grinder

means a direct saving.

Whether or not our judgment on this point is correct, it is certainly true that the savings in wear and tear on cars *plus* the savings made by insuring long life of rails, *plus* the satisfaction of the public in quiet, smooth-running cars, makes the use of Reciprocating Track Grinders a mighty profitable investment.

This is definitely proven by the unanimous verdict of electric railway companies who are regularly using Reciprocating Grinders and who are placing repeat orders for these ma-

chines *after* having completely demonstrated their efficiency, economy and thoroughly reliable service.

Roads using these machines regard them as *standard* equipment because they do the work *right*—and because on account of their simplicity and power they require no skilled superintendence and do the work cheaply.

We are always willing to put a machine on the tracks of any company for trial *at our risk*. And they never come back.

Railway Track-work Co.

30th and Walnut Sts., Philadelphia, U. S. A.



THE BUDA CO.



Factory—HARVEY, ILL.

Manufacturers of

Highest Grade Railway Track Work.
Switches—Mates—Frogs—Crossings
and Complete Layouts, Spring
Boxes, Derails, etc.

Solid Manganese,
Manganese Centre and
Bolted Construction in all standard
sections of Girder and Tee Rails.



SALES OFFICES:



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NEW YORK—The Buda Co., Hudson Terminal Bldg.

PHILADELPHIA — Maurice Joy, Franklin Bank Bldg.

SAN FRANCISCO—F. F. Bodler, Monadnock Bldg.

LOS ANGELES—S. I. Wallis, Trust & Savings Bldg.

PORTLAND — W. F. McKenney, 54 First St.

SALT LAKE CITY—C. H. Jones, Kearns Bldg.

KANSAS CITY—George T. Cook, Finance Bldg.



Kilby Manganese Special Work



Crossings, Frogs, Switches, Switch
Stands, Rail Braces, Special Work,
Built Up, Hardened Center or Solid
Manganese Construction.

Catalogue upon application

Kilby Frog & Switch Co., Birmingham, Alabama

The Engineers of Great Railroads Specify "Armco" Iron Culverts



An "Armco" Iron Corrugated Culvert under a heavy fill on the Western Pacific

The Convenience, Strength, Adaptability and Lasting Quality of

"ARMCO" IRON CULVERTS

have caused their adoption by hundreds of well-equipped engineers in highway and railroad work. High-purity "Armco" (American Ingot) Iron has raised the corrugated culvert from the position of a temporary makeshift to that of a reliable and lasting installation.

Write the nearest Manufacturer for particulars and prices on "Armco" Iron Culverts, Flumes, Plates, Sheets, Roofing and Formed Products



Resists Rust

Arkansas, Little Rock
Dixie Culvert & Metal Co.
California, Los Angeles
California Cor. Culvert Co.
California, West Berkeley
California Cor. Culvert Co.
Colorado, Denver
R. Hardesty Mfg. Co.
Delaware, Clayton
Delaware Metal Culvert Co.
Florida, Jacksonville
Dixie Culvert & Metal Co.
Georgia, Atlanta
Dixie Culvert & Metal Co.
Illinois, Springfield
Illinois Corrugated Metal Co.
Indiana, Crawfordsville
W. Q. O'Neill Co.
Iowa, Des Moines
Iowa Pure Iron Culvert Co.
Iowa, Independence
Independence Culvert Co.

Kansas, Topeka
The Road Supply & Metal Co.
Kentucky, Louisville
The Kentucky Culv. Mfg. Co.
Louisiana, New Orleans
Dixie Culvert & Metal Co.
Maryland, Baltimore
Wm. M. Baker, Munsey Bldg.
Massachusetts, Palmer
New England Metal Cul. Co.
Michigan, Bark River
Bark River Bridge & Cul. Co.
Michigan, Lansing
Michigan Bridge & Pipe Co.
Minnesota, Minneapolis
Lyle Corrugated Culvert Co.
Minnesota, Lyle
Lyle Corrugated Culvert Co.
Missouri, Moberly
Corrugated Culvert Co.
Montana, Missoula
Montana Culvert & Flume Co.

Nebraska, Lincoln
Lee-Arnett Co.
Nebraska, Wahoo
Nebraska Culvert & Mfg. Co.
Nevada, Reno
Nevada Metal Mfg. Co.
New Hampshire, Nashua
North East Metal Culvert Co.
New Jersey, Flemington
Pennsylvania Metal Cul. Co.
New York, Auburn
Pennsylvania Metal Cul. Co.
North Dakota, Wahpeton
No'western Sheet & Iron Wks.
Ohio, Middletown
American Rolling Mill Co.
The Ohio Corrugated Culvert Co.
Oklahoma, Shawnee
Dixie Culvert & Metal Co.
Oregon, Portland
Coast Culvert & Flume Co.

Pennsylvania, Warren
Pennsylvania Metal Cul. Co.
South Dakota, Sioux Falls
Sioux Falls Metal Culvert Co.
Tennessee, Nashville
Tennessee Metal Culvert Co.
Texas, Dallas
Wyatt Mfg. Co.
Texas, El Paso
Western Metal Mfg. Co.
Texas, Houston
Lone Star Culvert Co.
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Virginia Metal Culvert Co.
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Spokane Cor. Cul. & Tank Co.
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Bark River Bridge & Cul. Co.

If you are—

An Executive, an Editor,
or connected with a Business Paper in any capacity;
an Advertiser in a Business Paper;
an Advertising Agency or Service Man;
a Teacher of Advertising,
or an "Advertising Man"—

You are invited

to attend the annual convention of the ASSOCIATED BUSINESS
PAPERS which will be held at

THE HOTEL ASTOR, NEW YORK

October 26, 27 and 28

(Better mark these dates on your calendar now)

We use the word "convention" because we must, but, in this instance, it is far from having the conventional meaning. This gathering of the men who control and use the great highways of business news and thought will mark the opening of a new epoch, not alone in the progress of business journalism, but in advertising itself. (And this is not a mere figure of speech.)

For publishers, there will be open forum sessions for the free discussion of problems relating to every phase of the making of good business newspapers.

For advertisers, there will be an exhibit of successful advertising campaigns, including the plan, the copy, the supplementary work, the results. Ideas that have produced thousands of dollars, that have cut the cost of selling, will be shown in complete detail.

Advertising agents and service men will hear real experts tell how to produce resultful business paper copy, and will get many valuable ideas on the practical use of the trade and technical press.

The far-seeing, progressive agency man will also be not a little interested in the helpful spirit of co-operation that is being developed between this type of agency and the business press. To such this will be an unusual opportunity.

For all, there will be an upward urge, new inspirations, a freshened enthusiasm, and three days in the world's metropolis at the most delightful season of all the year.

Better make up your mind to come

THE ASSOCIATED BUSINESS PAPERS

(Succeeding the Federation of Trade Press Associations)

A. A. GRAY, President
608 So. Dearborn Street
Chicago

JESSE H. NEAL, Executive Secy.
231 W. 39th Street, New York City
(Temporary Address)



ATLAS WEED-KILLER

Grass and Weed-Killing Chemical

Clean Track Service



Complete Reports are Now Being Issued to Our Clients

During June, July and August our service trains have been busy killing weeds by the Atlas Chemical method.

Operating at speeds as high as 20 miles an hour, Atlas sprinkling trains have cleared up thousands of miles of steam and electric railway track—leaving a broad, clean, weed-free swathe on railroad right of way.

This has been accomplished without interfering with railroad traffic. Atlas Service is complete in itself, from producing the chemical down to the actual application.

Atlas Service goes further than filling the Contract

Now, in the Fall, our men are busy going over every foot of treated track—inspecting conditions and interviewing division officials so that we may be sure results are satisfactory.

Written reports, including comparative photographs taken before and after application, will be submitted within a month to every official interested.

Not until these reports are in the proper hands is our service complete.

If you are interested in cutting the cost of your track policing, as regards eliminating vegetation, write for booklet entitled "Clean Tracks." If you seriously want more definite information, we will gladly have a weed expert call upon you by appointment.

Atlas Weed Killer must sell itself upon results

Every man in the Atlas organization is either a weed-killing expert or an operative. You will have no salesmen call upon you, except upon request, and then the man we send will be a weed-killing expert, not a salesman. He will go over your track, study the vegetation and give an intelligent estimate of the cost of cleaning your right of way.

This—together with the recommendation of other roads which use Atlas year after year—enables you to consider Atlas on a basis of facts.

Atlas Preservative Company of America, (Inc.)
95 Liberty Street, New York City



BEFORE APPLICATION



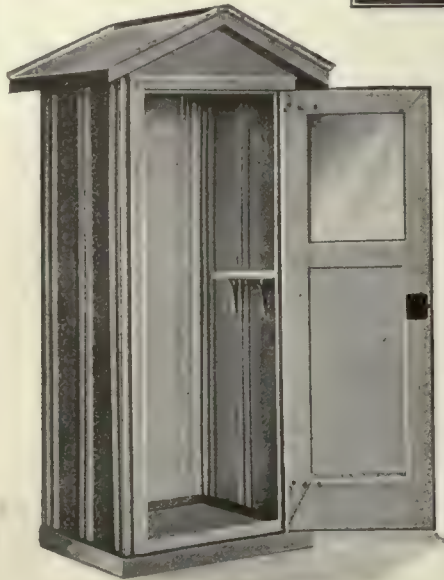
TWO WEEKS LATER

"PRUDENTIAL"

**GALVANIZED
STEEL
BUILDINGS**

**PORTABLE
FIREPROOF**

7-8-9-10-12 FT. WALLS



PHONE BOOTH NO. 8



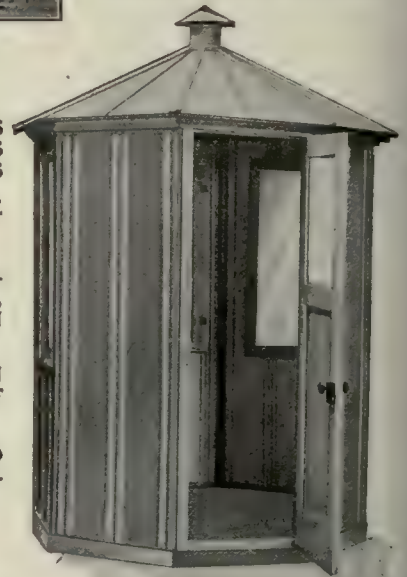
OFFICE AND FREIGHT SHED

"PRUDENTIAL"

**GALVANIZED
STEEL
BUILDINGS**

**PORTABLE
FIREPROOF**

7-8-9-10-12 FT. WALLS



FLAG STATION NO. 61

REMEMBER

**WE CAN ADJUST OUR UNIT PARTS
TO MEET YOUR STANDARD PLANS
FOR ALL ONE STORY BUILDINGS**

EVERYTHING THAT ENTERS THE

CONSTRUCTION

**ABOVE THE FLOOR LINE IS IN-
CLUDED: HARDWARE, GLASS, ETC.,
PLANS, DETAILS AND ERECTION
INSTRUCTIONS—**

**TIME AND MONEY ARE SAVED IN
"PRUDENTIAL" FIREPROOF
BUILDINGS.**

**ORDER A PRUDENTIAL SHIPPED
TO STATION—AND YOUR ERECT-
ING CREW DOES THE REST.**

MANUFACTURED BY

C. D. PRUDEN CO.

BALTIMORE, MD.

DRAIN THE ROADBED

If the drainage isn't thorough and constant, Electric or Steam Railway tracks sag. Then they have to be "pumped up."

It's much cheaper to put down good drains that will be dependable and permanent—(not fragile) such as

"DURO" Railway Drains

(Nestable—Patented)

Corrugated and Perforated

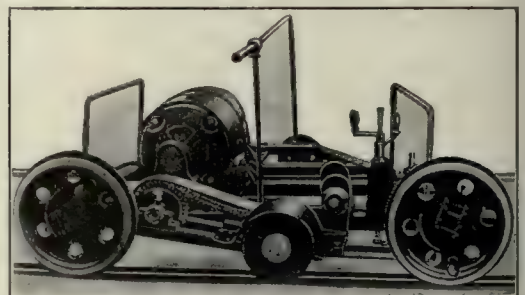


*The Pennsylvania Railway uses "Duro"
Drains alongside these "water pans"*

Last as long as the roadbed. "DURO" drains are anti-corrosive, made of NO-CO-RO METAL. They are re-galvanized after being perforated. No raw edges.

Shipped knock-down and nested—they can not be damaged in transit. Any required diameter from 6" to 36"—either round or flat bottom. WRITE FOR CATALOG G3.

THE CANTON CULVERT & SILO CO.
MANUFACTURERS
CANTON, OHIO, U.S.A.

**Portable Rail Grinder**

Is practical and efficient

Is portable, fast and simple to operate

Is easily placed on and removed from track

Is adjustable to all conditions of grinding

Is high grade, low in cost and in maintenance

Is now in use on the largest railways in America

Is needed on every railway

Is the machine you will eventually buy

See It at the Convention

One Demonstration Will Convince You

E. P. Seymour Portable Rail Grinder Co.

Waltham, Mass.

Section

2

Line

THIS section is devoted chiefly to advertisements of equipment for transmission, distribution and signaling, such as—

Wood Poles

Steel Poles and Steel Towers

**Cross-arms and Other Fittings for
Both Poles and Towers**

**Aerial and Underground Cables
and Wire**

Trolley Wire

**Insulators, Connectors, Terminals
Splicers, Clamps, Etc.**

**Motor Trucks in Forms Especially
Adapted to Electric Railway
Service**

**Trolley-Contact Signals and
Time-Inspection Systems**

PROCEED!!

Block Signals, Time Inspection and the Hamilton Watch make Electric Railway Service Safe



Eight Reasons Why You Should Adopt Time Inspection for Your Road

Because it is just as important to check your trainmen's watches as to check the wear of a bearing.

Because every trainman must know that his watch will not be permitted to overstep the danger mark of 30 seconds variation per week.

Because the watches of opposing crews must run exactly alike to prevent trouble in making turnouts.

Because the possession by trainmen of accurate watches makes a favorable impression upon passengers who know that the train will leave on exact schedule time.

Because your testimony before a jury as to the *time* features of an accident will gain immeasurably when backed by your use of a time inspection system.

Because, in city operation, accurate watches conduce to better maintenance of time points and closer agreement between the reports of inspectors and car crews.

Because the chances of collision between freight, construction or other non-schedule trains will be greatly reduced.

Because, and chiefly, exact time is the essence of safe railroading and cannot properly be left to the individual employee for attainment.

We want to send you the booklet reproduced above and help you on your time inspection problems

Hamilton Watch Co.

Lancaster, Pa.

Hamilton Watch Movements sell from \$12.25 upward. You can have a Hamilton movement fitted to your present Watch Case. Consult your Jeweler. No extra charge for Safety Numerical Dial on new Hamilton Watches of railroad grades.



The A - B - C
of Steel Trans-
mission Structures
and
Catenary Bridges



Archbold-Brady
Company
SYRACUSE, N. Y.

*Design and manufacture
of Wire-Supporting Structures
exclusively.*



Phono-Electric

The Trolley Wire of Long Life



Phono-Electric

is Worth Its Price

(An advertisement based on an interview with the line engineer of a large city company)

It costs more to make Phono-Electric Trolley Wire than other kinds.

Its *first* selling price is therefore higher, but you can be sure that its *ultimate* selling price is not higher.

Have you determined the line of demarcation between Phono-Electric and copper on each of your lines?

Here are some places where Phono-Electric Trolley Wire is always the lowest-priced in the end.

Opposite are shown views of Phono-Electric installations in Oakland, Philadelphia, Brooklyn, Chicago and Rochester—only a few of the cities wherein Phono-Electric has proven "The Trolley Wire of Long Life."

On heavy lines where wire is worn rapidly.

On curves and turnouts where wheel-hammer and side wear are common.

On grades where abnormal currents must be collected.

On narrow streets where replacements are difficult.

As Phono-Electric is good for at least three times the wear of ordinary wire and with astonishingly fewer breaks, it will often pay to put it up even in comparatively light service.

BRIDGEPORT BRASS COMPANY
BRIDGEPORT CONNECTICUT



DREW Motorman's Safety Mirror

Obviates platform accidents — reduces running time safely.
Shows motorman clear view of steps—on open or closed cars.
Costs little—never wears out. Easy to attach.
Special literature on request.

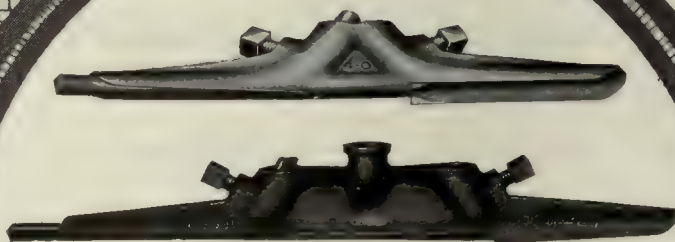
DREW

YOU will find in Drew Overhead Materials that every phase of operation has been anticipated. "Lowest cost per car mile" is the basis on which they are made and sold.

So, naturally, wherever operating costs are considered when purchasing, you find Drew materials specified.

Special Electrical Castings to Order

The Drew Foundry has sufficient extra capacity to care for a limited amount of special casting in bronze, brass and other non-ferrous metals. When in the market for special designs—it will pay you to have *Drew* Quotations.



SAMSON Splicers

Prove lowest cost per car mile. This is the reason no wise road ever changes from Samson's. They are non-arcng, stay upright in the span, do not form hard spots, and are stronger than new wire. The last word in splicer efficiency.

Samsons are supplied in all sizes for round, grooved and figure 8 wire. Send for details.

Drew Electric

1016 E. Michigan

District Representatives

Holden & White, Inc.
1508 Fisher Building.
Chicago, Ill.
Brown & Hall Sup. Co.,
1124 Pine St.,
St. Louis, Mo.
Railroad Signal Sup. Co.,
Hackney Building,
St. Paul, Minnesota.

Wm. F. McKenney,
54 First Street,
Portland, Oregon.
Frank F. Bodler,
903 Monadnock Bldg.,
San Francisco, Calif.
S. I. Wales,
Trust & Savings Bldg.,
Los Angeles, Cal.

DREW Triple Beam Insulator



On account of the great strength, light weight, smooth operation and lasting service efficiency, this has come into very high favor wherever operating cost records are consulted when purchasing. Ask for details.

RAILWAY SPECIALTIES

Proven designs, carefully made from tested materials mean longer life in service, greater ease in installation and utmost efficiency in operation.

In every case, it will pay you to have Drew Quotations.

Ask for Complete DREW Catalogue

The Drew Catalogue is a handbook of dependable electric railway, light and power materials. It also contains much other valuable data that makes it a handy book for every purchasing agent and superintendent of overhead have. Sent free—ask for it.

DREW Mfg. Co.

Indianapolis, Indiana

District Representatives

W. J. Connor, Majestic Building, Denver, Colo.	Schoen & Jordan, 1312 Healey Building, Atlanta, Georgia.
F. S. Wakefield, 312 Busch Building, Dallas, Texas.	C. E. A. Carr, 2 Toronto Street, Toronto, Ont., Canada.
A. P. Kelley, 61 Calvert Building, Baltimore, Maryland.	H. S. Salt (Export Agent), 114 Liberty Street, New York, N. Y.



DREW Pole Sleeves

Wherever there's a steel pole—there is need for a Drew Pole Sleeve. Gives great additional life at small cost. Makes reclaimed poles stronger than new. Send for special literature every line superintendent should have.



DREW Clinch Ears

The design of Drew Clinch Ears is the result of close study of all actual operating conditions. As a result Drew Ears are standard. Every feature that makes for lasting life in service and ease in installation is included.

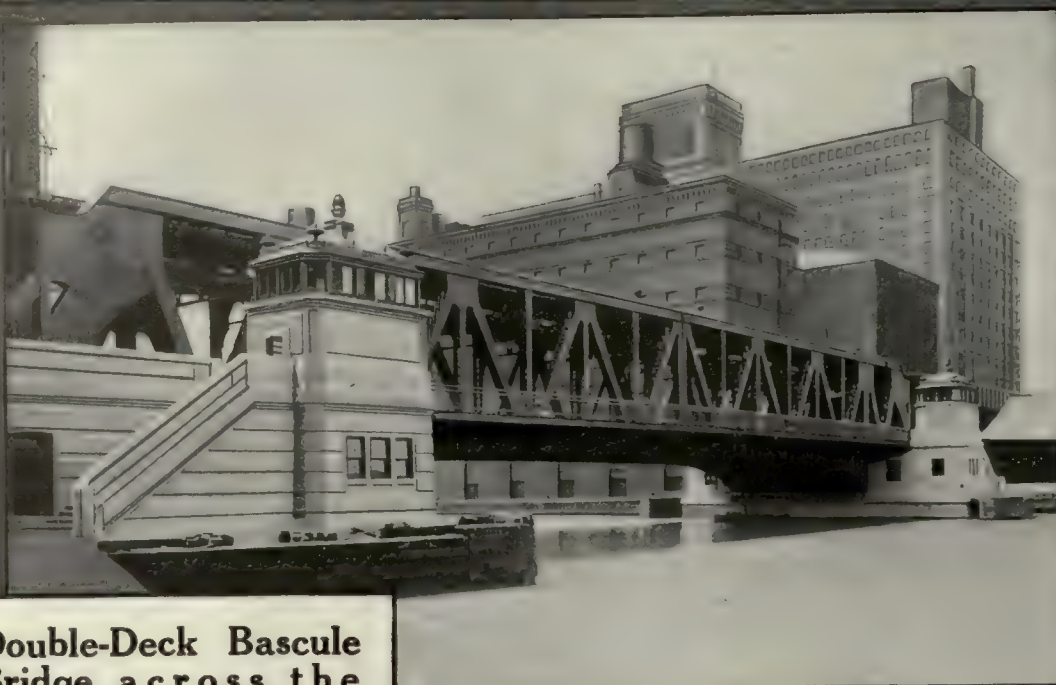
Especial attention to the composition of the bronze used and care in casting mean additional "Service Efficiency."



DREW Trolley Frogs

The right basic design, modified to meet every operating condition. Easy to install. Saves trolley wheel and wire wear, because of smooth "take" and "leave"—obviates "trolley off." Bronze or malleable. Send for informative literature.





**Double-Deck Bascule
Bridge across the
Chicago River at
Lake Street**

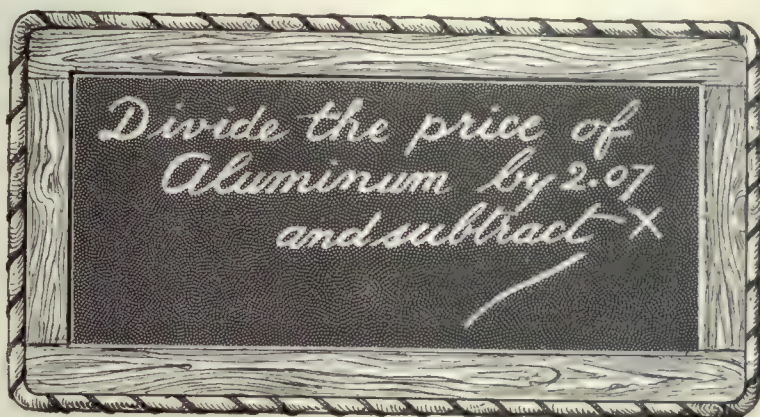
used by Chicago
Elevated Railways
and Surface Lines

Kerite Insulated Wires and
Cables used in the Electrical
Interlocking System.



KERITE INSULATED WIRE & CABLE COMPANY
NEW YORK CHICAGO





The Answer Is Aluminum Electrical Conductors

The weight of a thousand feet of copper wire is 2.07 times the weight of the same length of aluminum of the same conductivity. Therefore, divide the price per lb. of aluminum by 2.07 and you get the price reduced to copper equivalent. But what about X?

That little X stands for big savings in first cost and maintenance of towers or poles, insulators, pins, splices, etc., due to the light weight and shorter span advantages of aluminum over copper.

When you realize what X means to you, ask us for the Y of "Aluminum Electrical Conductors." It is a real handbook of technical matter which shows the practical idealism of aluminum for feeder and transmission lines.

**ALUMINUM COMPANY
OF AMERICA
PITTSBURGH, PA.**

New York Boston Chicago San Francisco



CUT THE COUPON

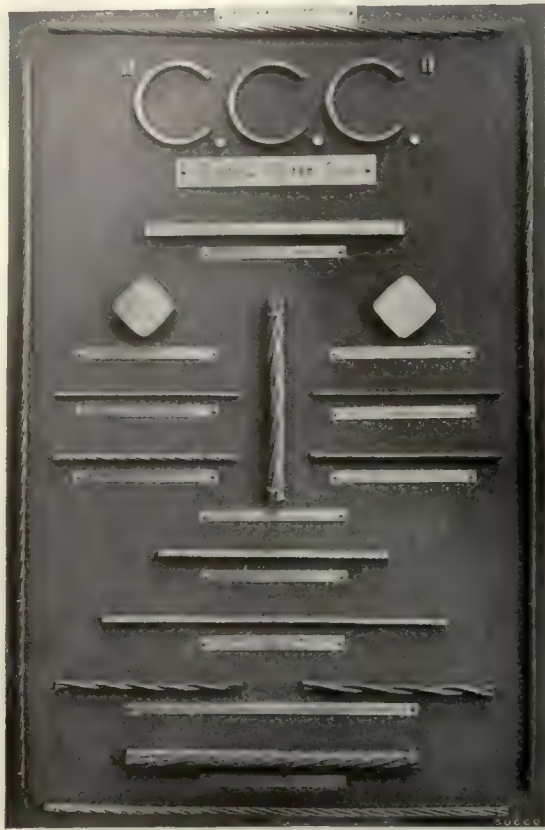
Aluminum
Company of
America
Pittsburgh, Pa.

Gentlemen: Kindly
mail me your new book
on "Aluminum Elec-
trical Conductors."

Name
(Full name and title.)

Address
(City and Street.)

Occupation



Reproduction of one of the sample boards, 19 by 29 inches in size, forming part of our A. E. R. A. Convention Exhibit. This board shows Colonial Copper Clad Steel wire and sections of wire-bars and rods from which they are rolled and drawn.

For Your Inspection

we have on exhibition at Booth 388 a representative display of samples of bare and insulated electric wires and cables and cable accessories which we believe will interest every purchaser and user of such products. The display consists in part of sample boards (one of which is reproduced above) containing a wide variety of samples of the following products:

Bare Copper Wire
Brass and Bronze Wire
Colonial Copper Clad Wire
Magnet and Weatherproof Wire
Varnished Cambric Insulated Cable
Paper Insulated Power Cable

This is a portion of our exhibit at the Panama-Pacific Exposition which was awarded a gold medal—the highest specific award for products of this class, and the eighth award of this degree which STANDARD Products have received at as many different exhibitions.

We invite inspection of these products and you will be cordially welcomed at our booth.

Standard Underground Cable Co.
Pittsburgh, Pa.

Boston	Atlanta	Chicago	San Francisco
New York	Pittsburgh	Detroit	Seattle
Philadelphia	Cleveland	St. Louis	Los Angeles
Washington	Minneapolis	Salt Lake City	

For Canada—Standard Underground Cable Co. of Canada, Limited, Hamilton, Canada.



INSULATOR CLAMPS, new types, that are adjustable. Better and different from anything heretofore. Not costly; the logical way to attach wires to insulators and especially adapted for Electric Railway service.

OVERHEAD PROTECTIVE CROSSING CLAMPS, approved by the Telephone, Electric Railway Companies, etc.; an essential safety device where electric lines cross above telephone, telegraph or other power lines. Why not assure your safety at these points?

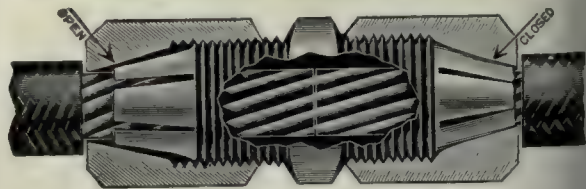
SEAMLESS COPPER SPLICING SLEEVES for "splicing" your transmission or ground lines, selected and used on their merits by the Chicago, Milwaukee & St. Paul Ry. Co., Southern Power Co., Mississippi Power Co., etc.; an easy joint to make without heat or solder.

SPLIT TINNED COPPER CONNECTORS, LIGHTNING ARRESTERS, CASTINGS, STEEL.

Your inquiry is solicited now for future if not present requirements.

"Hatch Specialties"
 120 Broadway New York

FREE



—a handbook on economical connections—and a sample Frankel Solderless Connector

MAKERS OF THE BEST ONLY
FRANKEL
 CONNECTOR CO. INC. N.Y.

Factory:
 177-179 Hudson St.,
 New York
 Sales Rooms:
 733-735 Broadway

The man on your road responsible for economical and proper electrical connections will appreciate the story that this book and sample connector will tell.

Both represent new ideas—both point the way to better splices.

You incur no obligation in writing for them. Do it now.

ARISTOS "COPPERWELD" COPPER CLAD STEEL WIRE

From **INTENSE HEAT** Instantly **To** **ICE-COLD WATER**



HAS NO EFFECT ON THE PERFECT WELD

—hence electrolysis can never take place

Made in 40%, 30% and Mechanical Grade.

Aristos "Copperweld" Wire costs less per pound than copper wire, is 7 per cent lighter (size for size), is 60 per cent stronger, and therefore can be used in smaller sizes, giving better service; averages 126 per cent greater elastic limit, and does not reach a "yield point" under extremely heavy snow and ice storms; costs less to maintain—therefore, for all these reasons, is cheaper for the following purposes:

Trolley Wire; Strand; Tie Wires, Bare and Weatherproof; Telephone and Signal Lines; Ground Rods; Guy Wires; Heavy Screen Mesh; Nails and Staples.



Western Sales Office:

Steel Sales Corporation
Chicago, Illinois

Eastern Sales Office:

Page Woven Wire Fence Co.,
30 Church St., New York

Made from the product of **COPPER CLAD STEEL CO., Pittsburgh, Pa.**

Drawn and Sold Exclusively by

PAGE WOVEN WIRE FENCE COMPANY
MONESSEN, PA.



Collins

Electric Track Switches

Think for the motorman

Everybody knows there is nothing like an electric switch for maintaining schedules. But it must be a good switch—one that is really automatic and doesn't get out of order easily.

The Collins Electric Track Switch is that kind of a switch. Firstly, because it is made right. Secondly, because its ability to stay right does not call for the motorman to do any thinking.

The motorman has enough to do to watch his track and use his head and hands to work his brakes and control apparatus. If you give him a track switch that calls for thinking on his part for proper operation, you will either be disappointed in the switch or the motorman.

We are talking about average motormen because those who are above the average don't remain motormen long—they become general managers.

Collins Non-Splashing Electric Track Switches think for the motorman. A car can stand directly under the contactor for an indefinite period without damaging the equipment.

Then, too, the switch cannot be thrown between the trucks of a car by a following movement under the contactor.

These features alone make the Collins worth while. There are other good reasons why the Collins is the best electric track switch on the market.

THE HITS BUNCHED

It does not splash mud and water; the switch cannot be thrown between the trucks of a car by a following movement under the contactor; the street box is automatically sealed and without dependence on the proper making up of pipe joints or gaskets; a most positive anti-straddling device is provided; only 110 volts is sent into the street box; the entire mechanism can be lifted out of the street box without making any disconnections; the contactors are exceedingly small and simply mounted on standard ears; standing under the contactor for an indefinite period has no damaging effect on any part of the mechanism.

United States Electric Signal Company
West Newton, Massachusetts

Representatives:

Western: Frank F. Bodler, Monadnock Bldg., San Francisco
Chicago, Warren Moore Osborn, McCormick Bldg.

Foreign: Forest City Electric Services Supply Co., Salford, England



New Contactor Signal

The Attainments

1. High Speed Standard Aspects

Registers safely without the motorman being obliged to watch the signal for a momentary change in the aspect as he operates it. Aspects same as standards on steam railroads for forty years.

2. All Light Signal

Red means stop. Green means go. Yellow means go, another car ahead, no confusion, just three plain colors, always the same whether for registering, non-registering, spacing, terminal or other signal equipment.

3. Lights Are Safe and Dependable

Because of our patented current regulator the lamps remain at constant candle power. This makes a light signal practicable even though operated from trolley current.

4. Full Operating Flexibility

Cars may enter or leave the block at any of the four points and register correctly and in a safe manner. Simultaneous entry at opposite ends gives one car the proceed and the other the stop. Overrunning the stop aspect and backing out provided for. Cars may enter one end and leave the other at the same time.

5. Line Wire Troubles

A feed crossed with registering out contactor wire will not register a car out. No cross, break, ground nor feed on either contactor or signal wires affects safety. No condition permits proceed aspects at both ends at the same time.

6. Accessibility

Mechanism is mounted on shelves which can be pulled out without making any disconnections. Contacts automatically made up when shelf is in place.

7. A. E. R. A. Signal Committee Recommendations

Complies with the 1916 recommendations of the A. E. R. A. Signal Committee and is the only system that does this.

8. High Speed Contactor

A contactor with nothing in the path of the trolley wheel, very light and mounted on one standard ear.

And Other Perfections

Come to Space No. 401 and see this Signal

United States Electric Signal Company

West Newton, Mass.

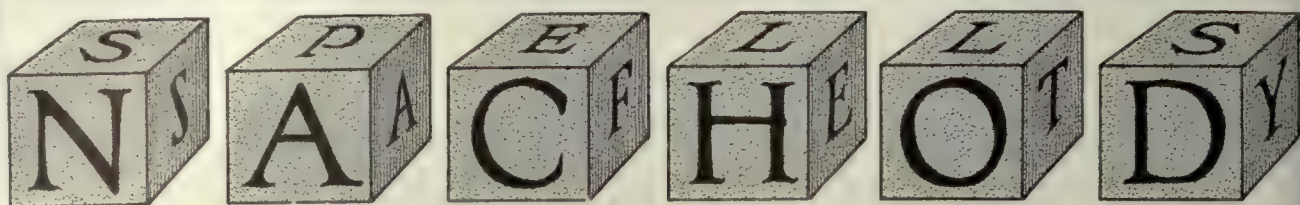
Representatives

Western: Frank F. Bodler, Monadnock Bldg., San Francisco

Chicago: Warren Moore Osborn, McCormick Bldg.

Foreign: Forest City Electric Service Supply Company, Salford, Eng.





NACHOD SIGNALS
give high protection at a small ultimate cost. Made for single-track opposing movements, absolute or permissive, and for double-track following movements.

NACHOD CROSSING BELLS

warn the public of danger from approaching cars, and advertise to the public progressive railway operation.

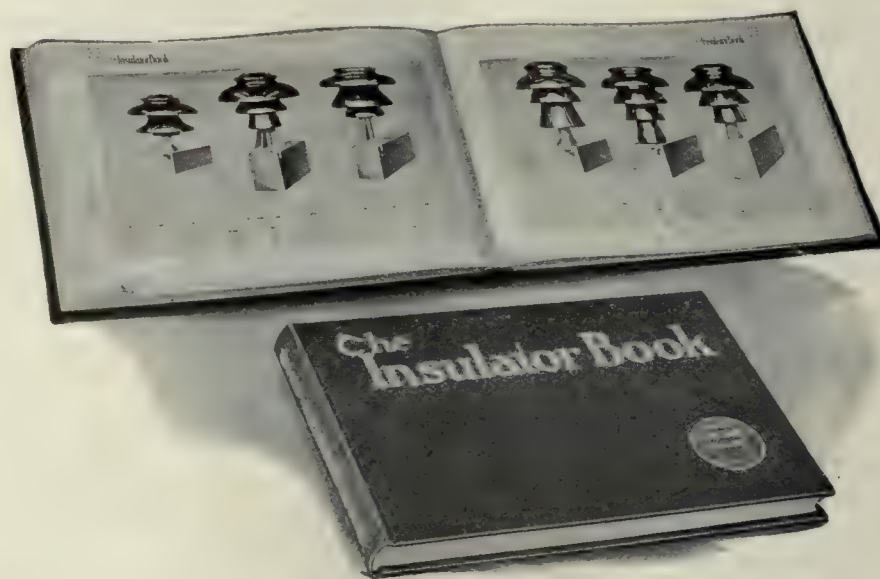
NACHOD HEADWAY RECORDERS

give an accurate record at the end of the day of the entire car operation at a given point.



Better write us for details. For safety's sake—do it now.

NACHOD SIGNAL COMPANY, INC., 4773 Louisville Avenue, LOUISVILLE, KY.



The New Insulator Book—The most complete and comprehensive edition ever issued. Write for a copy.

THE LOCKE INSULATOR MFG. CO., Victor, N. Y.

New York City Office, 50 Church Street



A Remarkable System of Railway Signaling

For your own advantage, for the interests of your company, and for the benefit of the traveling public, you should be fully informed regarding the merits and technical operation of the Simmen System of Continuous Cab Signals. A brief summary of a few of its features should convince you that it is well worth careful investigation.

CONTROL By means of interlocking control switches the dispatcher can give "stop" or "proceed" signals to the motorman directly in his cab, without intermediate operators or messages.

RECORDS The system provides for an automatic record in graphic form of train movements. This gives the dispatcher full knowledge of the whereabouts of all trains, enables him to direct their movements perfectly, and serves as a permanent record of schedules maintained, speeds, etc.

FACILITY The system facilitates quicker and more frequent train movements, with absolute safety, greatly increasing the capacity of a single-track road. The dispatcher can change a meeting or passing point instantly without the least risk, simply by changing the interlocking control switches in his office. In this way, in case of delay to one train, opposing

trains will not waste time waiting for a "meet" and extra trains and other unexpected train movements may be directed with as great facility as the movements of regular trains.

SIMPLICITY Line wire and short contact rails at intervals are the only part of the system installed along the roadway. All apparatus is installed in the dispatcher's office and in the cab under constant experienced supervision.

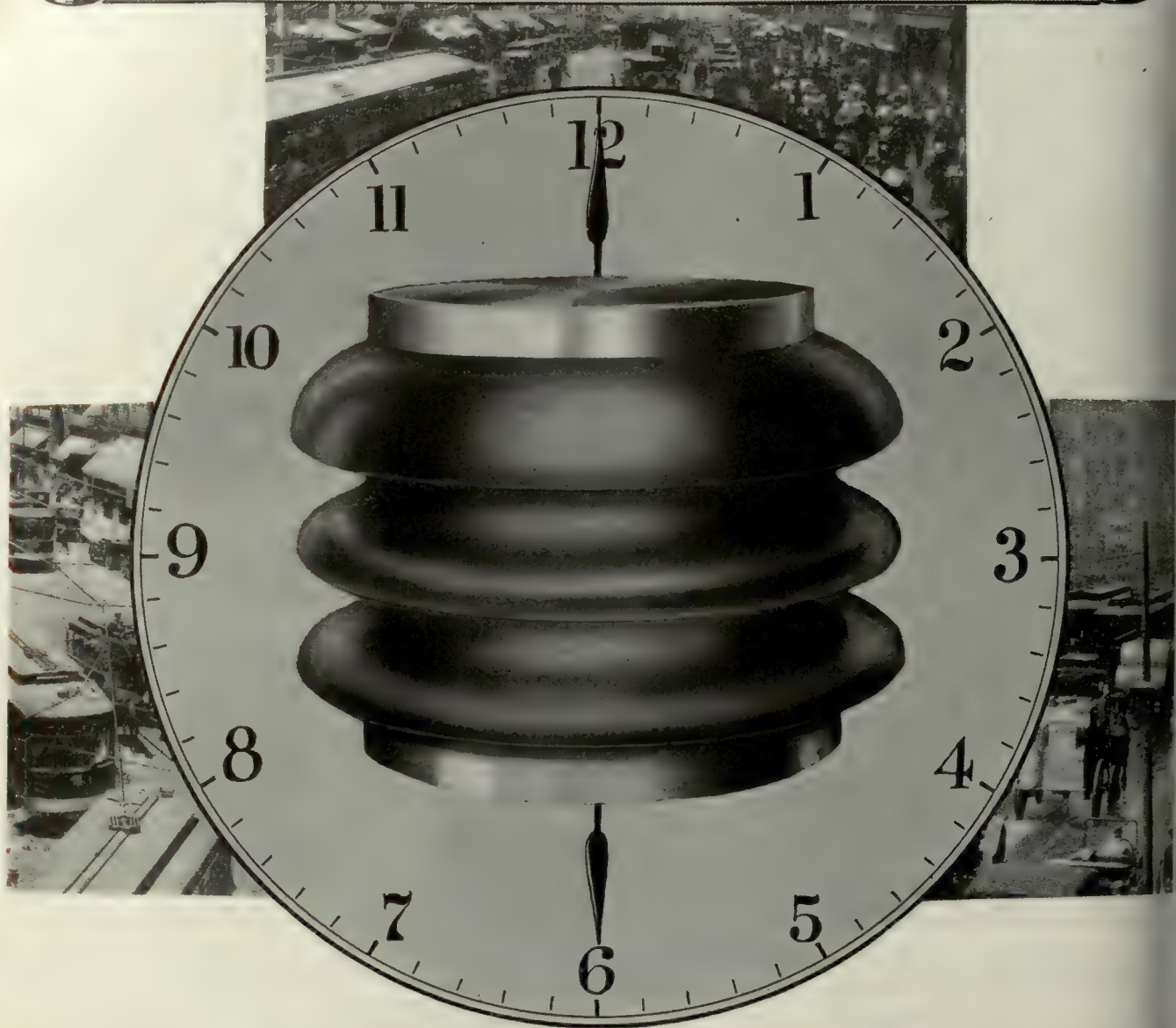
SAFETY Its operation has proved it wonderfully successful. One of the virtues of the system is the fact that if any part becomes deranged or inoperative, the signal displayed is always that of "danger" or "stop." The dispatcher's signaling switches interlock, so as to make "lap orders" impossible.

COST The first cost is far less than that of the automatic block system, and is in proportion to the amount of traffic.

SIMMEN AUTOMATIC RAILWAY SIGNAL CO.

1575 Niagara Street, Buffalo, N. Y.

Pacific Coast Representative: W. H. Crawford, 609 Spalding Bldg., Portland, Ore.



Never fail at the critical moment

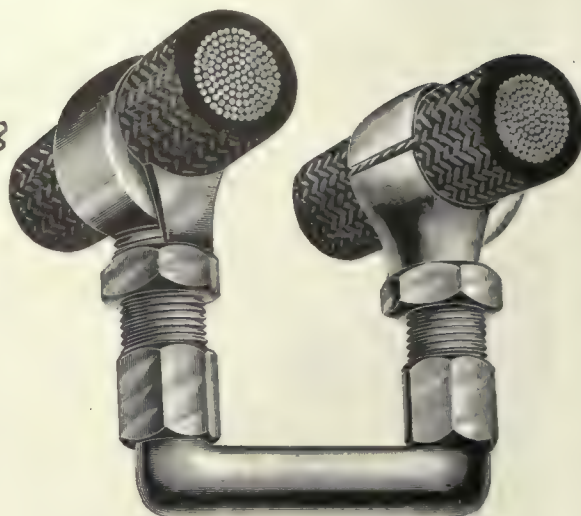
The maximum factor of safety of Pittsburg Insulators, determined by the most rigid tests under the supervision of trained engineers assures you of that dependence in insulators which is so important in railway line or transmission service.

We carry Standard Insulators in stock for every requirement. Put your Insulator Problems up to us

The Pittsburg High Voltage Insulator Co.

Main Office and Factory, DERRY, PA.

Westinghouse Electric & Mfg. Company, East Pittsburgh, sole agent for United States.
 Canadian General Electric Company, Toronto, Canada, sole agent for Dominion of Canada.
 Harmon S. Salt, 114 Liberty Street, New York, Export Agent.



**Dossert Cable Taps
for Equalizing**

DOSSERT CONNECTORS AND TERMINALS

"They're What I Want"

says the expert wireman or cable splicer. "Cut out those flossy soldering tools.

"I can do more work in less time with Dossert Connectors and a wrench than two men can do with those fancy things you're trying to hand me."

The good workman knows that he can do better, quicker work with Dosserts. And it's money in **your** pocket to see that **all** your wiremen use them.

Using Dosserts throughout power houses and substations, for car wiring systems and junction boxes, and sectionalizing cases of Signal Control circuits, is a heap cheaper than paying extra labor.

One Man—One Tool—One Minute

That's what Dossert efficiency means. Our catalog is yours when you want it.

DOSSERT & COMPANY

H. B. LOGAN, President

242 West 41st Street, New York



Bates Expanded Steel Truss Co.

208 South La Salle Street
Chicago, Ill.

One-piece Steel Trolley Poles by the thousand.
Try them. They speak for themselves.



Bates One-piece Steel Pole in use by
Des Moines City Railway Co.
Des Moines, Iowa

Bates Expanded Steel Truss Co.
208 South La Salle Street
Chicago, Ill.



Bates 50-foot Pole, well loaded, used by
Milwaukee Coke & Gas Co.
Milwaukee, Wis.

Just Out! BATES Steel Pole Treatise

is not merely a catalog. It's a worth-while collection of data and information that should be on the desk of every man who is interested in pole line construction and manufacture.

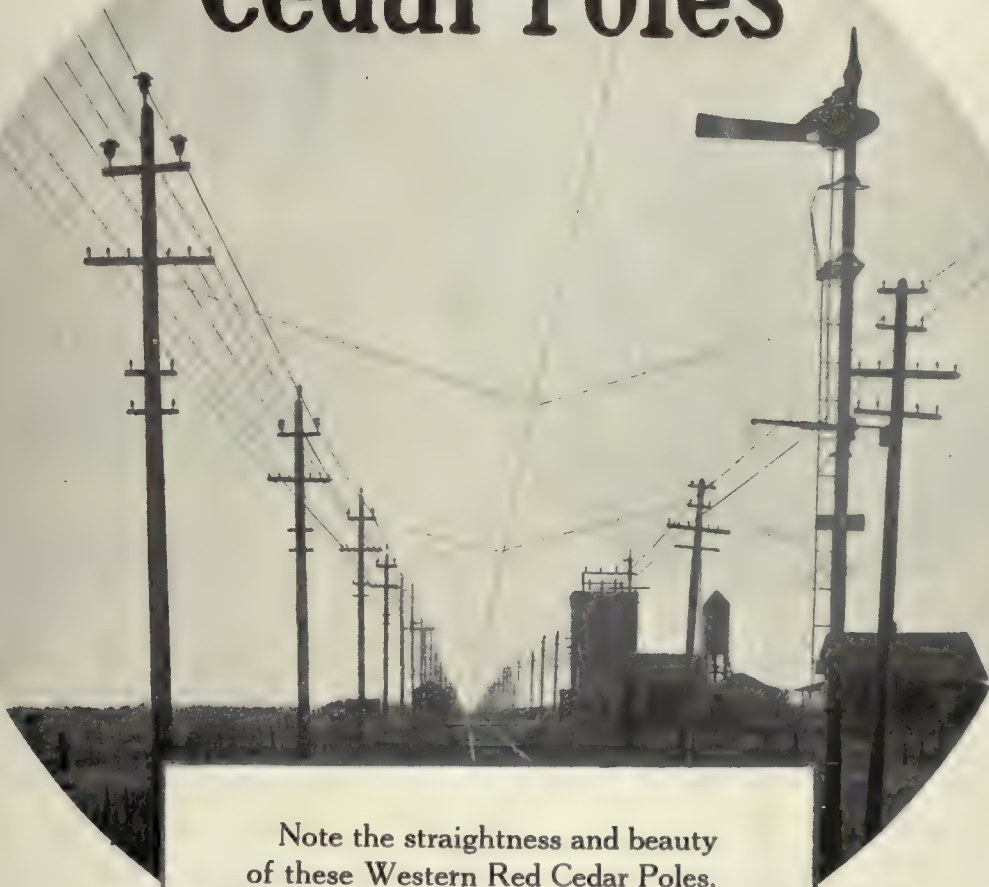
Send for your copy and keep it for future reference.

See Our Exhibit At the Convention

It will afford a wonderful opportunity to study the design and construction of Bates Expanded Steel Poles. We'll be there to answer your questions.

Exhibit No. 218

Western Red Cedar Poles



Note the straightness and beauty of these Western Red Cedar Poles, as straight as the factory-made semaphore mast.

**The Universal Poles for
Universal Service**

Western Red Cedar are the most beautiful of all poles. They have great strength. Their average Modulus of Rupture as shown by Project L-31A of the U. S. Forestry Service is 6910 lbs. to the square inch, which is greater than that of any other specie of pole timber in general use throughout the country.

Western Red Cedar Pole lines set 15, 16 and 17 years ago in widely separated sections of the country are shown by recent investigation to be in good condition and good for many years more of hard service. Both first cost and maintenance are low. Their light weight reduces cost of transportation and erection.

Western Red Cedar Association

Peyton Building, Spokane, Washington



ELRECO Tubular Con

**Lowest Cost
Lightest Weight**

Do you know there are more than 50,000 Elreco Poles in service in Chicago—more than 27,000 in Cincinnati—hundreds of thousands in service in other cities throughout the world?

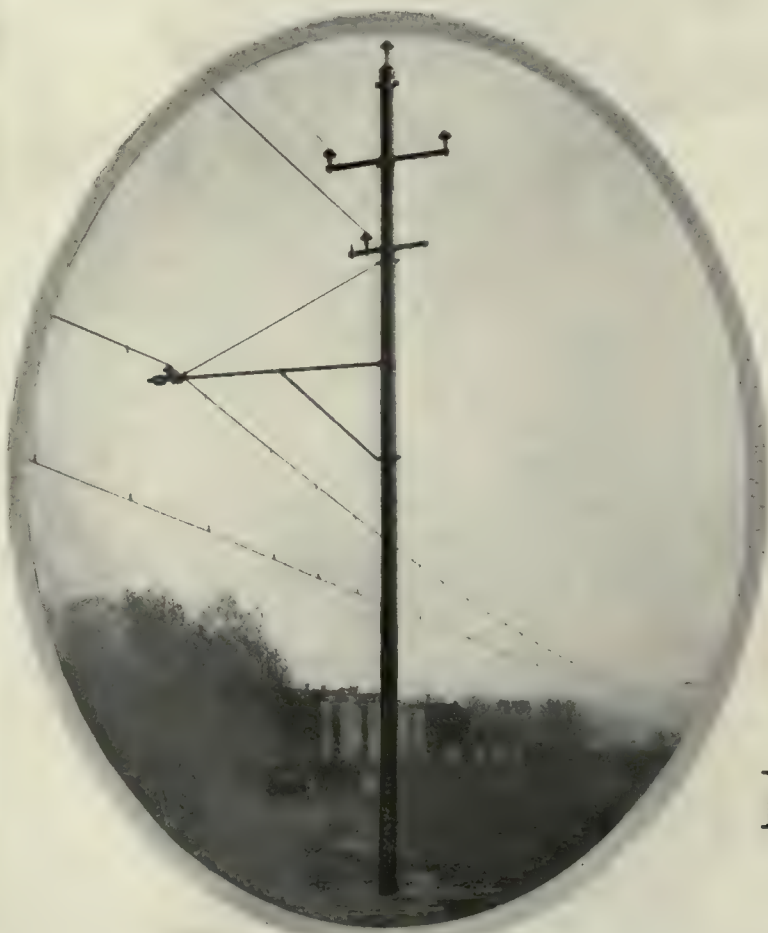
Mere claims wouldn't sell such quantities of poles, but their behavior in service does. Here are some Elreco truths:

Elreco Poles surpass every other form and shape of pole in uniformity and in ability to withstand strains in all directions.

They require less base room than any other pole.

They are least affected by corrosion.

They offer only slight oppor-



**Electric Railway
Cincinnati**
30 Church Street

ELRECO Poles

ine

**Least Maintenance
Greatest Adaptability**

portunity for hubs of vehicles to
engage them in passing.

They offer unexcelled ease in
painting.

Elreco poles cannot be climbed
by children.

They are most adaptable for
joint railway and lighting use.

A 30 ft. Elreco pole will weigh
about 50 lb. less and cost about
\$2.00 less than any other form of
metal pole of the same all-around
strength.

The Elreco pole is the only
steel pole ever recommended by
the Committee on Power Distri-
bution of the A. E. R. A.

Write today for Catalog No. 16
on "Pole Engineering" and what
the "Wire Lock" means.

Equipment Co.
Ohio

New York City

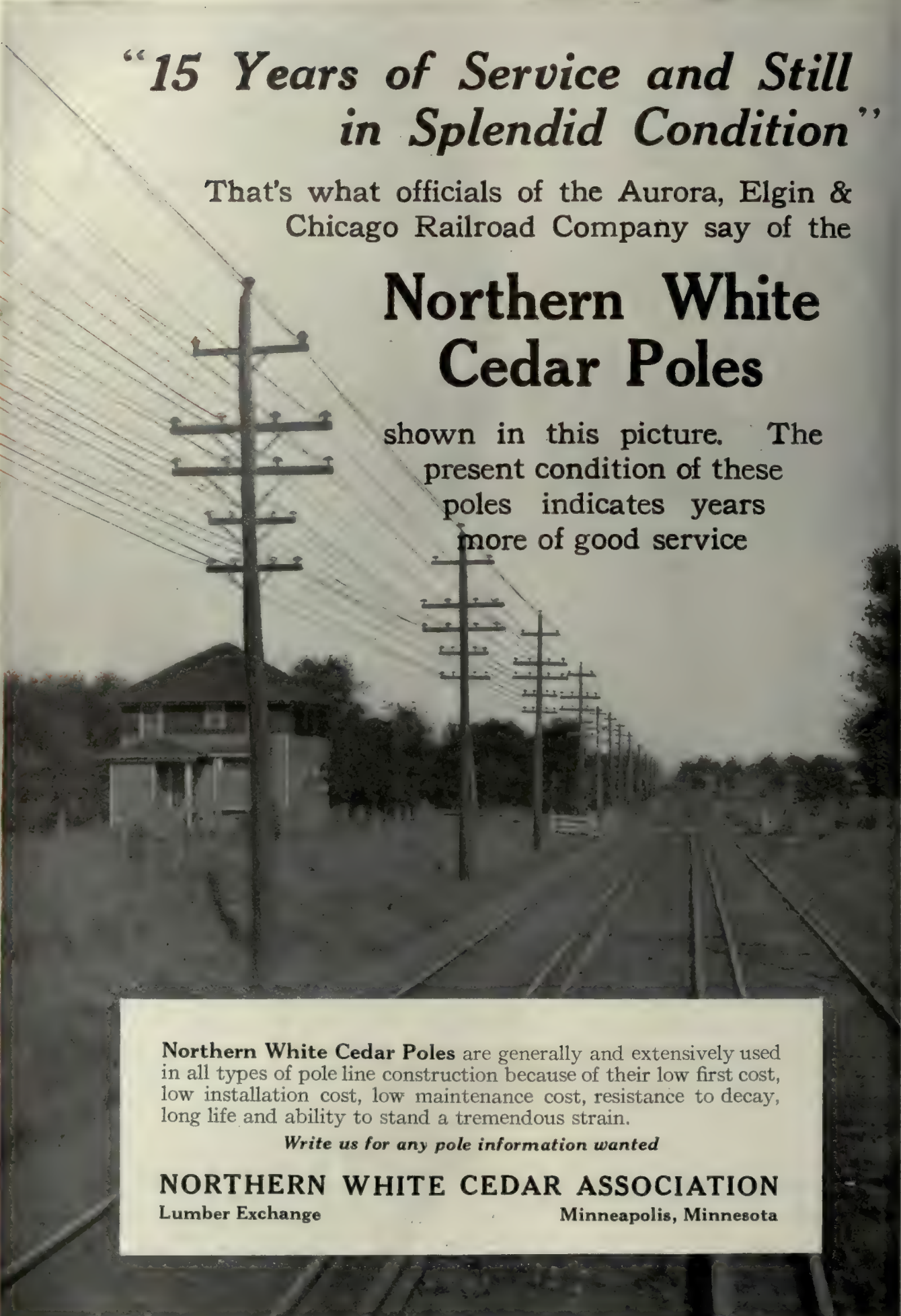


"15 Years of Service and Still in Splendid Condition"

That's what officials of the Aurora, Elgin &
Chicago Railroad Company say of the

Northern White Cedar Poles

shown in this picture. The
present condition of these
poles indicates years
more of good service



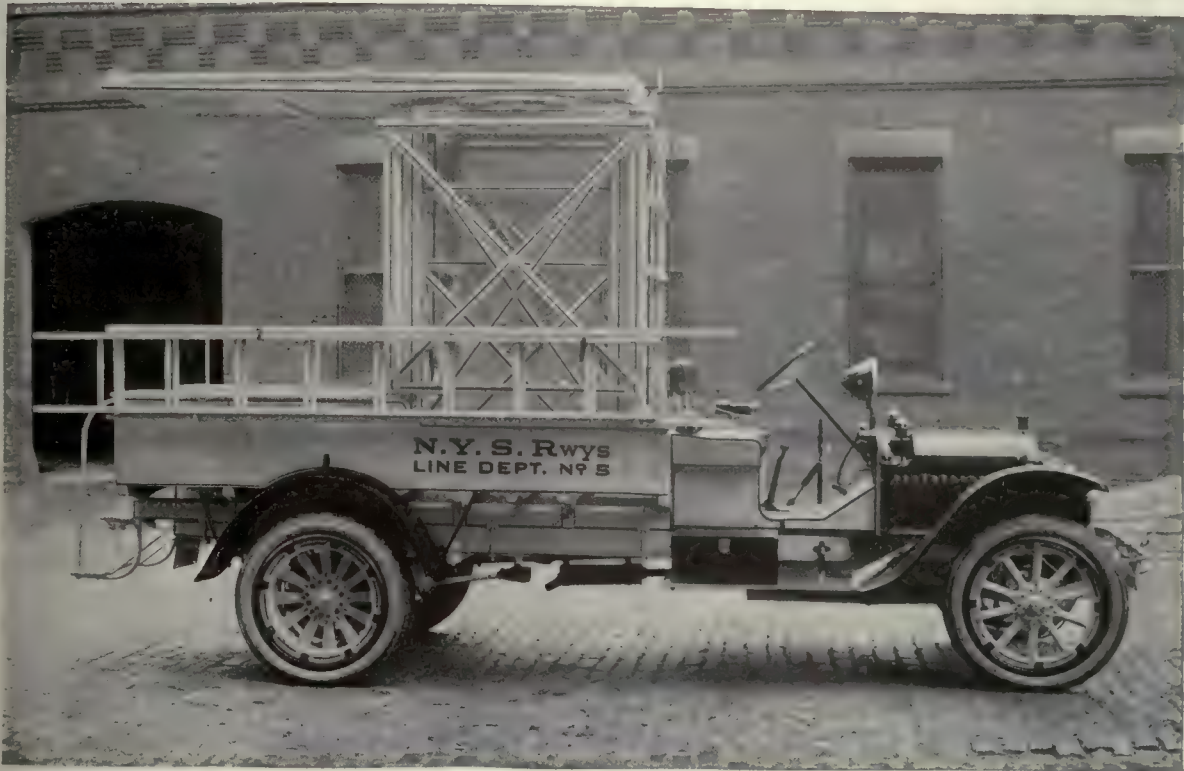
Northern White Cedar Poles are generally and extensively used in all types of pole line construction because of their low first cost, low installation cost, low maintenance cost, resistance to decay, long life and ability to stand a tremendous strain.

Write us for any pole information wanted

NORTHERN WHITE CEDAR ASSOCIATION

Lumber Exchange

Minneapolis, Minnesota



WHITE TRUCKS *for* Electric Railway Service

THE White 1½-2-ton tower truck and the 3-ton platform truck fitted with power winch and niggerheads, are two of the several types of motor apparatus designed and built by The White Company especially for Electric Railway service.

These trucks will be exhibited at the annual convention of the American Electric Railway Association, Million Dollar Pier, Atlantic City, October 9 to 13.

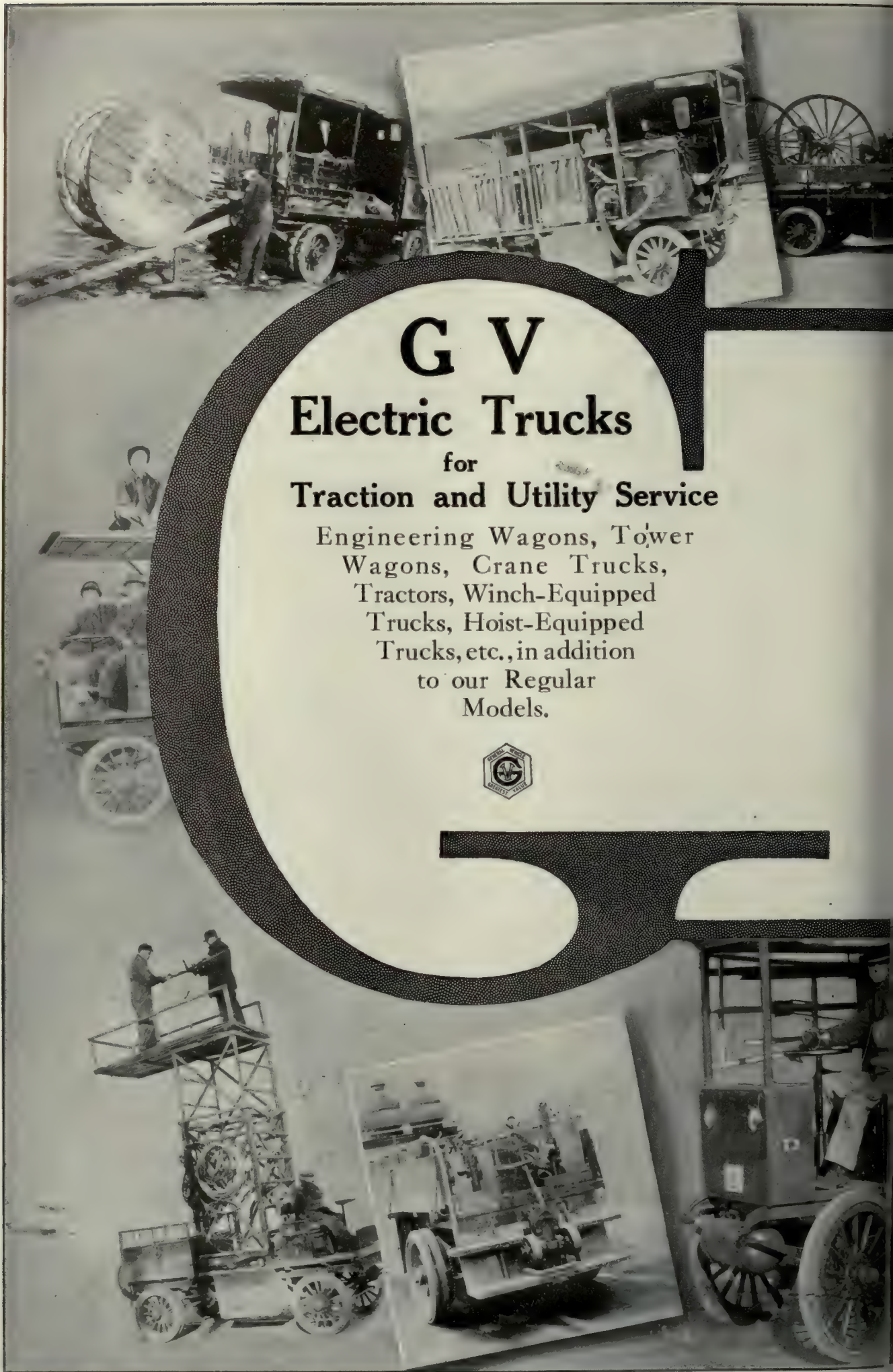
SPACE 211



THE WHITE COMPANY
CLEVELAND

Members of the American Electric Railway Association

GV
Electric Trucks
for
Traction and Utility Service
Engineering Wagons, Tower
Wagons, Crane Trucks,
Tractors, Winch-Equipped
Trucks, Hoist-Equipped
Trucks, etc., in addition
to our Regular
Models.





More than one hundred public utility companies are using this cheap and rapid method of trucking—getting **more** work done in **less** time at **reduced** cost, everything considered. Twenty-five big firms now use a total of 1137 General Vehicle Trucks—and the number is growing steadily as service tests prove out the efficiency and economy of these vehicles.

There is no vehicle need of the electric railway field that cannot be met quickly and exactly by General Vehicle Transportation Engineers. We offer the service of specialists in these matters and guarantee satisfaction. Don't get just "an electric truck." Get a G.V. Truck designed and constructed to meet the requirements of service on **your** road. Write today for a copy of Catalog J-28.



General Vehicle Company, Inc.

General Office and Factory
Long Island City, N. Y.

NEW YORK
BOSTON

CHICAGO
PHILADELPHIA



*Patented**Ask for
Prices*

White's Porcelain Trolley Hanger

is more easily installed and more satisfactory in service.

The insulator, stud and yoke are separable, yet they assemble as a unit. When the trolley ear is attached and screwed up firmly on the stud, it can be twisted around at right angles to the span wire without loosening the ear on the stud.

The head of the stud is countersunk into insulator so it can't turn after the ear is set in proper alignment.

The insulator is made of durable glazed porcelain. The yoke is galvanized iron. The stud is sherardized steel, or bronze bolts can be used instead of steel.

White's Porcelain Hanger is extremely durable, safe and low in cost, and WE CAN SHIP AT ONCE.

T. C. WHITE ELECTRICAL SUPPLY CO.

1122 PINE STREET, ST. LOUIS, MO.

Make YOUR Brains Pay Bigger Dividends

—just as thousands of other fellows in the electric railway field are doing.

They are probably not a bit brighter than you—but they are getting ahead faster—

Because they are studying developments in the whole field of electric transportation—they are not satisfied with their own individual share in the big work—they are getting a grasp on the broad principles underlying the industry.

They are forging ahead—and so can you, if you will spend a few hours each week in concentrated study of the

Electric Railway Journal

Johns — Manville



COVERS
THE CONTINENT

Serves More People in
More Ways than Any
other Institution of its
kind in the world.

TO miss the manufacturer's side of the convention is to rob your visit of a useful and interesting experience. In the technical field things move fast, changes in construction follow new ideas and new ideas develop almost overnight.

You, for example, may know Underground Distribution as an important Electric Railway topic, or that inclosed fuses are being used more extensively and studied more intensively than ever. But how much more intimate would your knowledge be if you actually examined Noark Distribution Material—if you saw samples of J-M Fibre Conduit or heard it talked by a specialist. You would be interested in the new 2500 volt glass stemmed Noark Fuse.

And this does not apply alone to things Electrical. You can see a different kind of Flooring, Waterproofing Materials, Heat Insulations, Fire Resistant Cements and J-M Asbestos Roofings that your Company may use some day on its buildings.

This explains why Johns-Manville have placed a complete exhibit of their products in eleven booths, from Booths 512 to 522, inclusive, to give you a convention idea of Johns-Manville Service.

In your own interest see it.



Service and Responsibility



The Lineman Says:

"K-I" SPLICING SLEEVES

Save Time for Me—and Money for the Road

When I make a splice with a "K-I" (Kisinger-Ison) Splicing Sleeve, I know it's there to stay—I know that if that particular wire ever comes down again, it will be because of a break somewhere besides where I've spliced it.

I don't have to unlimber the old torch-and-solder battery, either. Just slip the two ends of the wire into the sleeve, see that the two sliding wedges have

a good grip, and there you are—the "K-I" will stand a heavier strain than the wire itself. There's no tinkering with set-screws—no hammering—no bending of wires.

It's the simplest, strongest, most efficient splicer I've ever used. Yes, you can get it in all sizes and lengths, for all types of trolley wire. You owe it to yourself to find out more about them; better write to

Standard Railway Supply Co.

4229 Fergus St., Cincinnati, Ohio

**DIRECT READING OHMMETERS FOR
ALL CONDITIONS OF SERVICE—POR-
TABLE OR LABORATORY TYPES**



Write Us Your Requirements

Thompson-Levering Co., Philadelphia, Pa., U. S. A.

If this isn't your
personal copy of the
Electric Railway
Journal fill out this
form and mail it at
once before that good
resolution cools.

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Name _____

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Electric Railway Journal, 239 W. 39th St., New York

Section

3

Power Plant

THIS section is devoted to features characteristic of the modern power plant and substation. Among these features are—

Improved Fuel-Handling Apparatus

Stokers

Superheaters

**Washing and Cooling Equipment
for Turbines**

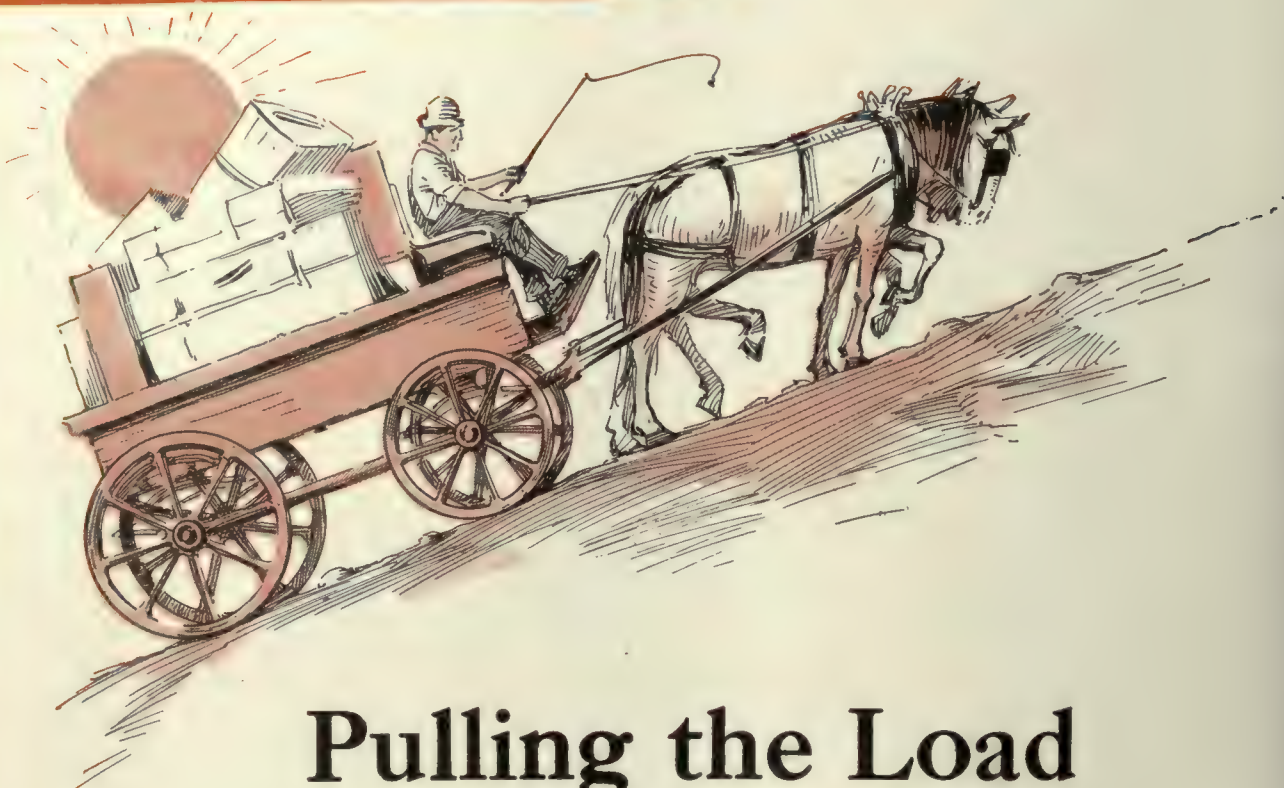
Pipe Coverings and Valves

Circuit-Breakers

Lubrication

And, finally

The Outdoor Substation



Pulling the Load

Down hill and on the level, a load moves easily; but up a grade it is a hard pull. You wouldn't try to move a load up hill with the brakes set. But that is the practice in many powerhouses. Any ordinary oil answers the purpose fairly well when the engines are running light, but when the load comes on and the pull is up hill, then every bearing should turn with the minimum of friction—you need the best oil you can buy.

Specially compounded of the finest materials to meet the severest service, Galena Oils are unequalled for powerhouse lubrication. They are so exceptionally good that we stand back of them with a guarantee of service and cost.

Galena-Signal Oil Co.

Franklin, Pa.

Your Plant Needs These Valves

It isn't safe to operate your boilers unless they are equipped with

Golden-Anderson Automatic Double-Cushioned Triple-Acting and Non-Return Valves

Work Both Ways Protecting the Boilers and the Steam Lines

"Life and Property Insurance Value"

1. Automatically protect the boilers in case of accident, due to bursted boiler tubes or other rupture.

2. Equalize the pressure between a battery of two or more boilers.

3. Automatically cut in and out the boilers and prevent such accidents of cutting in a boiler too soon due to inaccurate steam gauges. Also prevent steam being turned into a cold boiler, which is a safeguard while men are working inside of same.

4. Act as a regular hand-stop valve, as they can be closed by the hand-wheel, but not opened by same unless so desired.

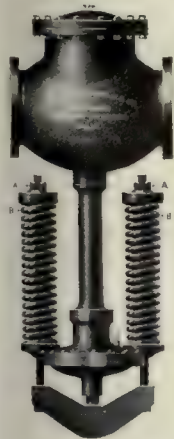
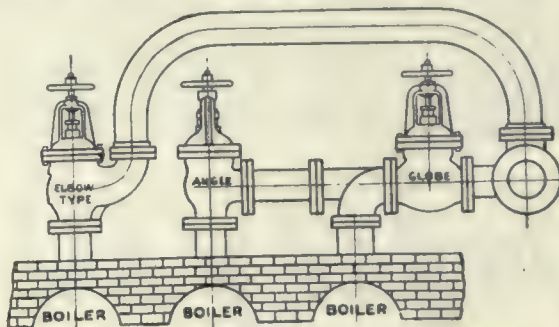
5. The only Non-Return valves that can be automatically tested in service.

The Triple-Acting Type, besides containing the above features, also operate in case of accident to the main steam line or branches, cutting off the flow of steam from the boilers, thus insuring protection to the power station throughout.

Make your power plant safe. Keep the boilers working at a uniform pressure and at increased efficiency. Your workmen can be made safe when repairing the inside of a cold boiler—no danger of steam being turned in to scald them to death—by equipping your boilers with Golden-Anderson Automatic Double-Cushioned Triple-Acting or plain Non-Return valves.



THE U. S. STEEL CORPORATION
ORDERS 1255
GOLDEN-ANDERSON
Triple-Acting and Non-Return Valves



Be Sure of Safety Provide all engines with Golden-Anderson Safety First Double Cushioned Quick Closing Emergency Trip Valves

They close automatically the instant that you press an electric button or open a small valve which may be located in the office, engine room or down in the mine.

They cannot open again until the pilot valve is reset by hand. This feature is very important. You can also close them by hand like any stop valve.

Fitted with double Corliss Dashpot which provides a positive cushion in closing, making it impossible for the valve to pound itself to pieces.

The H. C. Frick Coke Co. have 150 in service for the protection of their Power Stations.

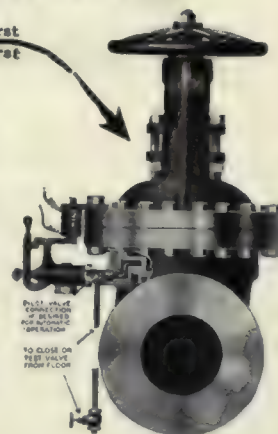
Golden-Anderson Automatic Cushioned Steam Pressure Reducing Valves

XX EXTRA HEAVY "For High or Low Pressure Service"

Embody the elements of simplicity, strength and reliability. Positive in action and always ready for service. Set valve to deliver high steam or other pressure at any reduced pressure and its action thereafter is entirely automatic. Nothing to break, stick or require attention. Perfectly cushioned when opening and closing and operates without noise. Will stand the wear and tear of years without repairs.

The very simple, correct, mechanical construction and operation insures a constant terminal pressure regardless of any fluctuation in the initial pressure.

Valves furnished cast iron, semi steel or cast steel for all pressures



The Golden-Anderson Float Valves

are instantly adjusted to operate quickly or slowly as desired. Indestructible. They are absolutely the only satisfactory float valve known for High or Low Pressure.

"Angle or Globe" 1/2" to 24"

Patented Cushioned Automatic Controlling Altitude Valves

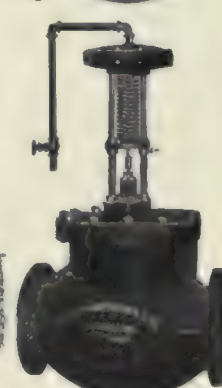
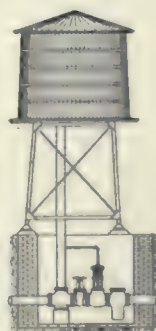
For Automatically Maintaining Uniform Stage of Water in Tank, Reservoir or Standpipes. Doing Away with the Annoyance of Floats or Fixtures, Inside or Outside. Especially Adapted for Water Works and Railroads.

"For High and Low Pressure"

"Works Both Ways"

"Most Satisfactory Valves Known"

Sizes to 24"



Automatic Float Valve
"Angle or Globe"

Standard Altitude Valve

Golden-Anderson Valve Specialty Co.

1231 Fulton Building,

Pittsburg, Penna.



17 Reorders

*from the
N.Y.N.H.&H.R.R.*

The Taylor Stoker

**Brooklyn Rapid Transit
Company orders 66
more TAYLOR STOKERS**

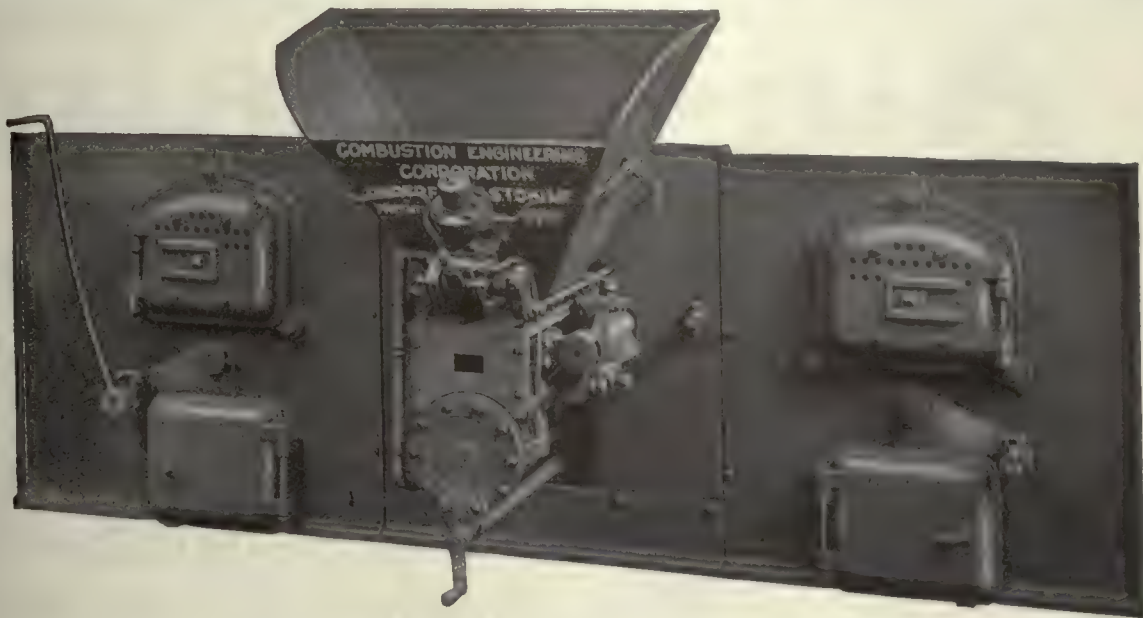
First order in December, 1914.
Repeat order for sixty-six
stokers for Kent Ave. Station
in December, 1915.

In September, 1909, the N. Y., N. H. & H. R. R. placed with us their first order for TAYLOR Stokers. Since then we have received from them seventeen repeat orders—the latest in April, 1916.

The efficiency, economy, flexibility and dependability in stoking service—the reduction of fuel, labor and maintenance costs effected—that earned these reorders has been duplicated in the experience of scores of electric railways the country over. Write for data.

***It pays to install the TAYLOR STOKER
in the first place***

American Engineering Company
Philadelphia



Your Problem

How to reduce the cost of making steam.

The price of coal has gone up.

What are you doing to offset it?

Our business is to supply you with the equipment that will do it.

Type "E" Stokers

Under-Feed—Self-Cleaning for bituminous coal

Coxe Stokers

The Anthracite Stoker. Coke Breeze

Combustion Engineering Corporation

Owners and manufacturers of

Type "E" Stoker—For Bituminous Coal
The Grieve Grate—For All Hand-Fired Fuels

Sole Representatives

Coxe Traveling Grate Co.—
The Automatic Anthracite Stoker

NEW YORK CITY
11 Broadway

PHILADELPHIA, PA.
718 Lincoln Bldg.

HAZLETON, PA.
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BOSTON, MASS.
Schumaker-Santry Co.

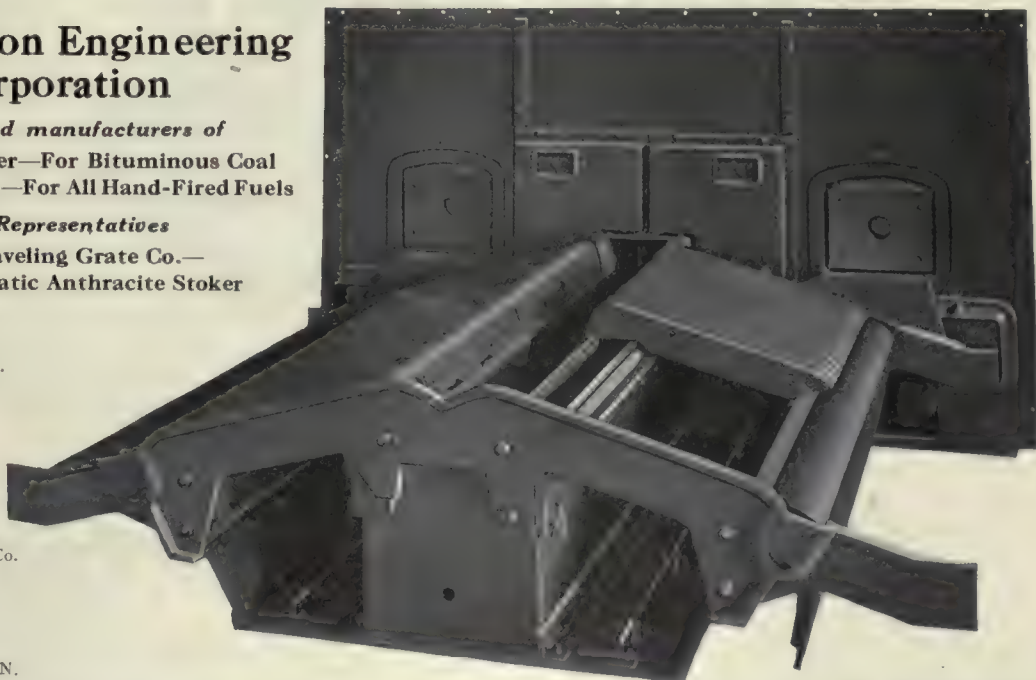
SALT LAKE CITY
American Stoker Co.

BIRMINGHAM, ALA.
Keiser-Geismer Engr. Co.

PITTSBURGH, PA.
Geo. J. Hagan Co.

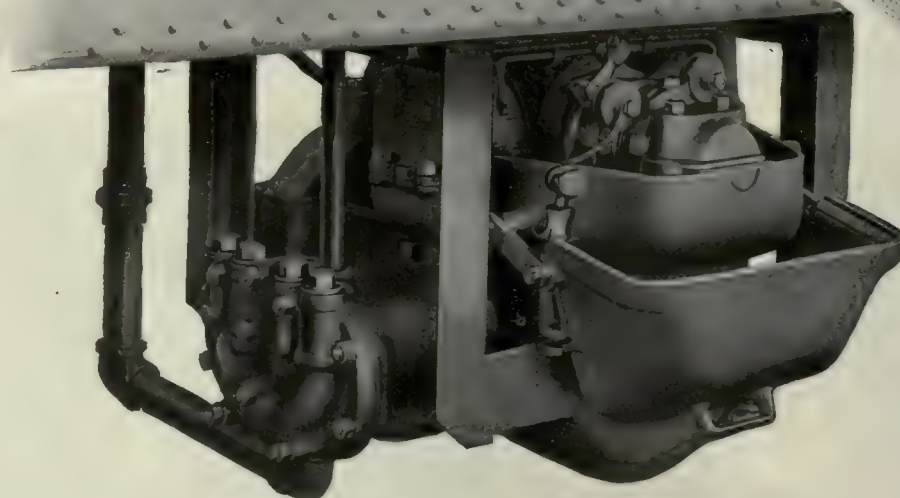
CHICAGO
Fisher Bldg.

MINNEAPOLIS, MINN.
Pocock & Pollard Co.



Allis-Chalmers

*Air Compressors, Governors
Valves and Whistles
Generating Units with
any type of prime mover,
Transformers,
Switchboards
and other
Auxiliaries.
Bulletins
sent on
request.*

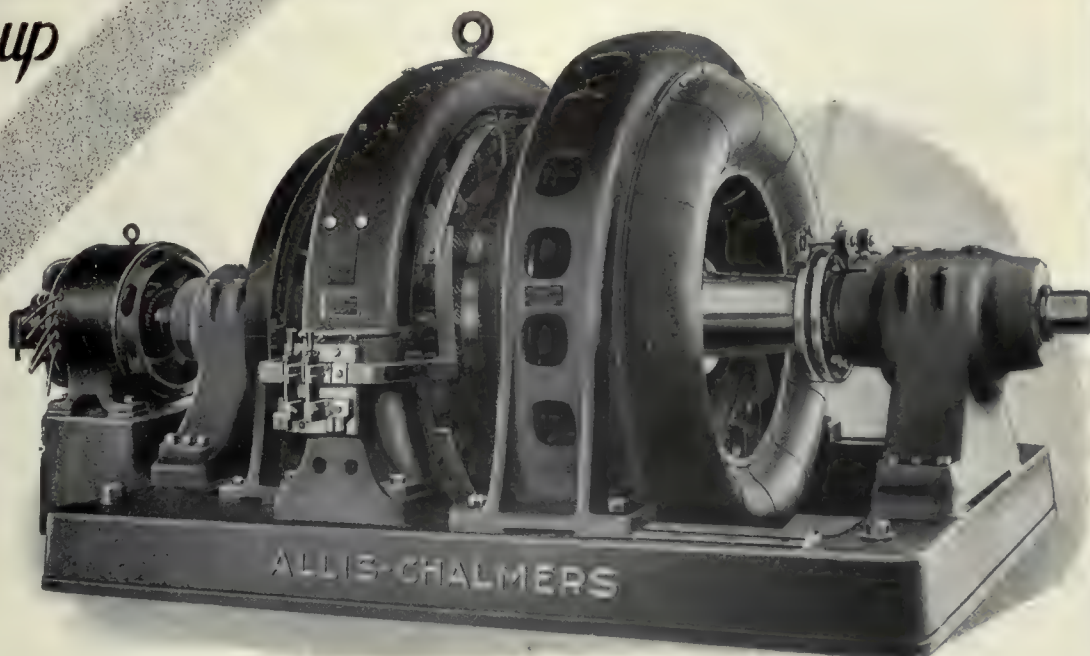


ALLIS-CHALMERS MANUFACTURING COMPANY
MILWAUKEE, WIS.

For Canada: Canadian Allis-Chalmers Ltd.

s Equipment

*Motor Generators for
all purposes with
Direct Current
Voltage up to 1500
Rotaries 25
and 60 Cycles
3 and 6 phase
Voltage up
to 1500*



ACTURING COMPANY
ISCONSIN

lms, Ltd., Toronto, Ont.

FOSTER SUPERHEATERS

FOR ELECTRIC RAILWAY SERVICE

After a thorough investigation of the merits of the different superheaters the following companies decided that the Foster was superior. Most of them have supplemented their first decision with additional orders.

These companies have had low repair costs, constant service and uniform superheat. If your engineering department makes a like investigation it will be well repaid.

Berkshire Street Railway Company
Bay State Street Railway Company
The Connecticut Company
Cleveland, Southwestern & Columbus
Railway Co.
Charleston Consolidated Railway &
Lighting Co.
The Cleveland Railways Company
El Paso Electric Railway Company
Fort Dodge, Des Moines & Southern
Railway Co.
Galesburg Railway, Light & Power
Company
Havana Electric Railway, Light &
Power Company
Iowa Railway & Light Company
Illinois Traction Company
Ithaca Traction Corporation

Jamestown Street Railway Company
Kentucky Traction and Terminal Com-
pany
Lackawanna & Wyoming Valley Rail-
way Co.
Milwaukee Electric Railway & Light
Co.
Mesaba Railway Company
Metropolitan Street Railway Company
(Kansas City, Mo.)
New York State Railways
New York, New Haven & Hartford
R. R. Company
Philadelphia & Western Railway Co.
Philadelphia & Westchester Traction
Co.
The Rhode Island Company
Rome Railway & Light Company
(Georgia)

Republic Railway & Light Company
Reading Transit & Light Company
Stone & Webster Engineering Corp.
Shore Line Electric Railway Co.
Terre Haute Traction & Light Com-
pany
Toledo Railways & Light Company
Virginia Railway & Power Company
Wisconsin Traction, Light, Heat &
Power Co.
Worcester Consolidated Street Railway
Co.
Winnipeg Electric Railway Co.
Wilmington & Philadelphia Traction
Co.
Waterloo, Cedar Falls & Northern
Railway Co.

POWER SPECIALTY CO.

111 Broadway, NEW YORK

Boston

Philadelphia

Pittsburg

Chicago

San Francisco

SKIP HOIST FOR ASHES

Cheapest to install, operate and maintain.

Not affected by heat, grit or water.

Can be operated by a common laborer.

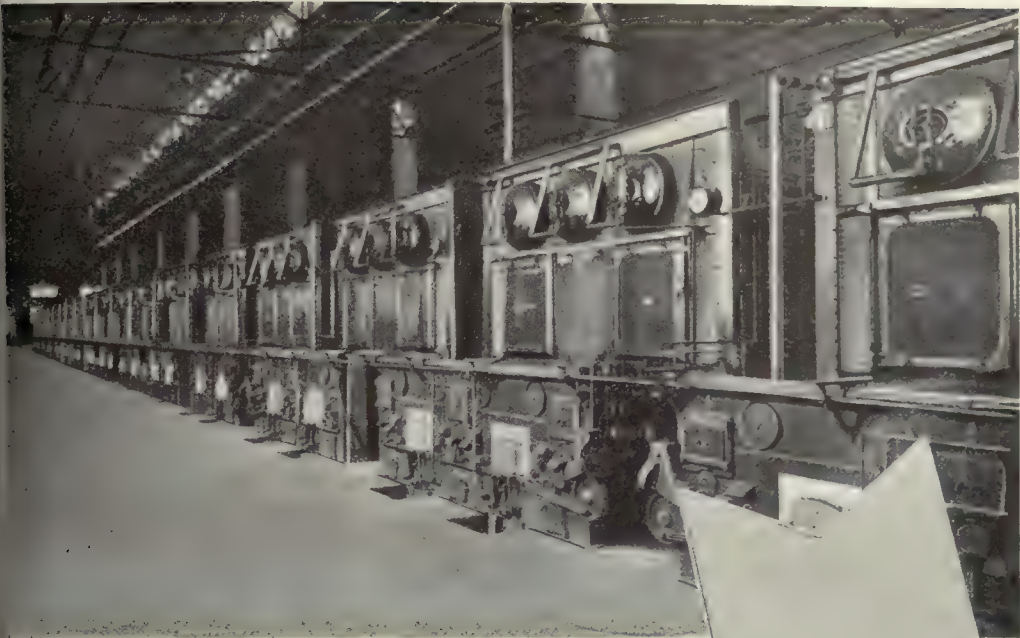
This machine saves the Eastern Pennsyl-
vania Railways \$12 per day, or over \$4000
per year.

High Capacity—High Lift
Low Power Consumption



We design and build all modern sys-
tems for handling coal and ashes in
boiler houses. Write us for prices and
information relative to the skip hoist
shown above, or any other device.
Plans and prices gladly submitted on
request. Write for catalog No. 20
showing all systems.

R. H. BEAUMONT CO., 111 So. 5th St., PHILADELPHIA



Brunot Island
Power House
Pittsburgh
Railways Co.
Pittsburgh, Pa.

Murphy Automatic
Furnaces, applied
to 13,924 H.P.
Babcock & Wilcox
Boilers

Get Every Possible Kilowatt Out of *Every* Ton of Coal

That's the power plant engineering problem facing every electric railway system—particularly in handling the rush-hour load.

The Pittsburgh Railways have met and solved this phase of their total operating problem with the

Murphy Automatic Furnace

Distributed as follows through their various stations:

Manchester Power House

First order	8 furnaces	1600 H.P.
Second order	4 furnaces	800 H.P.
Third order	4 furnaces	800 H.P.

Glenwood Power House

First order	6 furnaces	900 H.P.
Second order	2 furnaces	300 H.P.
Third order	4 furnaces	600 H.P.
Fourth order	8 furnaces	1600 H.P.

Brunot Island Power House

First order	32 furnaces	8000 H.P.
Second order	8 furnaces	4000 H.P.
Third order	4 furnaces	1924 H.P.

Homewood Car House

First order	3 furnaces	375 H.P.
Second order	3 furnaces	300 H.P.

West End Power House

First order	4 furnaces	400 H.P.
Second order	4 furnaces	400 H.P.

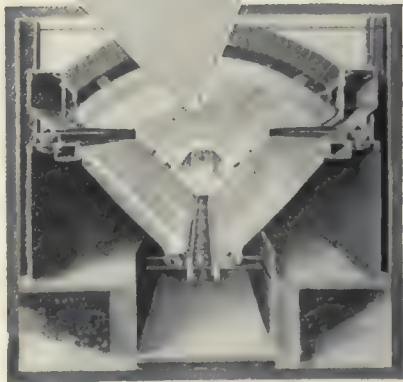
Duquesne Light Company

First order	2 furnaces	1370 H.P.
-------------	------------	-----------

Let us outline a plan for promoting efficiency and economy in your boiler room.

Ask for Catalog "C"

MURPHY IRON WORKS
Detroit Mich. U. S. A.



The Ideal Material for Fire-proof Isolation of Electrical Apparatus

Practically anything that can be made of wooden boards can be made of Ambler Asbestos. It can be cut with an ordinary saw to any desired shape, and can be drilled, screwed or nailed. The natural gray color is pleasing and permanent; painting as a preservative is unnecessary, but when desired it can be painted and grained and takes a good finish. It is completely non-combustible and will not carry or communicate fire through short circuits, electric flashes, oil explosions, etc. It withstands the direct application of the high temperature electric arc without disintegration, is an excellent heat insulator and a fair electric insulator.

Ambler Asbestos Building Products

COMPRISES:

Ambler Asbestos Fire-proof Building Lumber

Ambler Asbestos Corrugated Roofing and Siding

Ambler Asbestos "Century Brand" Shingles

Ambler Asbestos Fire-proof Sheathing, Fire-proof Millboards,
Fire-proof Paper and Fire-proof Coverings of every description.

Ambler Asbestos Building Products are made of Portland Cement, reinforced with Asbestos Fibre, built up layer on layer and then pressed free of air holes and surface irregularities. After setting of the cement and proper aging it forms a dense, tough structure that is virtually time, weather and fire-proof. Ambler Asbestos Corrugated Roofing and Ambler Asbestos Shingles "Century Brand" are the ideal roof for any building, never taking fire from without or permitting interior fires to spread to adjacent structures.

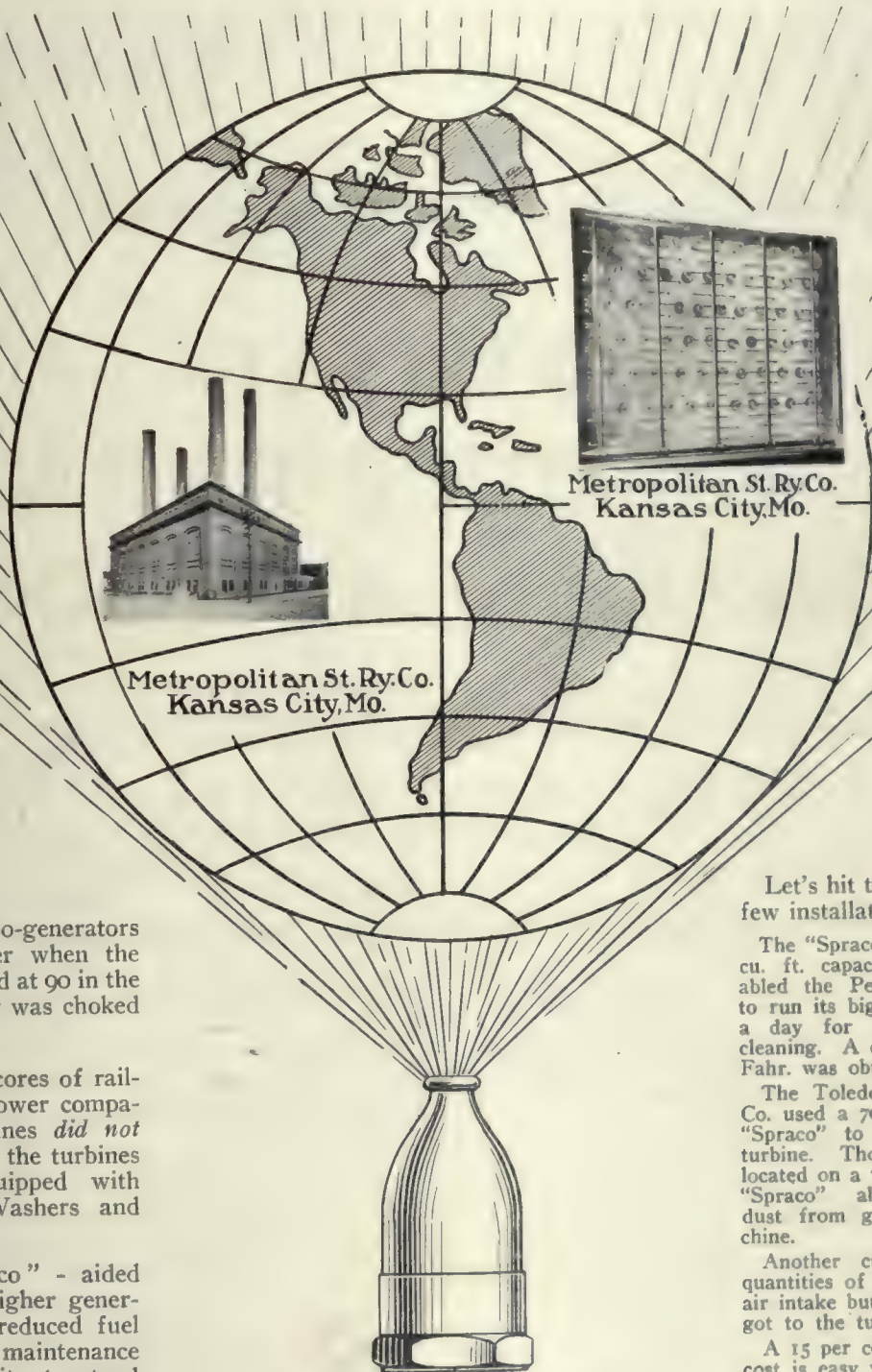
Ambler Asbestos Lumber is extensively used for the following purposes: Compartments and compartment doors for oil switches; switching gear; circuit-breakers; transformers, etc.; separating walls between high tension, heavily loaded conductors, bus bars, etc.; bus bar and wiring ducts; ceilings of oil switch and switching gear rooms and galleries; fire-proof boxes and cabinets; third rail guards; fireproof floors or floor linings in electric traction cars and in electric stoves and heaters.

Get the full story of Ambler Asbestos Products. Let us send you our literature, also samples for your examination and investigation.

KEASBEY & MATTISON COMPANY

Dept. X-2 Ambler, Pa., U. S. A.

"SPRACO" COOLING SYSTEMS



Metropolitan St. Ry. Co.
Kansas City, Mo.

Metropolitan St. Ry. Co.
Kansas City, Mo.

Did your turbo-generators loaf this Summer when the thermometer stood at 90 in the shade and the air was choked with dust?

We know of scores of railway, light and power companies whose turbines *did not* loaf. They were the turbines which were equipped with "Spraco" Air Washers and Coolers.

These "Spraco" - aided plants, showed higher generator efficiencies, reduced fuel costs, reduced maintenance charges and ability to stand the "gaff" when the peak came on.

TRADE MARK

REGISTERED U. S. PAT. OFF.

Let's hit the high spots of a few installations for you.

The "Spraco" Washer of 60,000 cu. ft. capacity per minute enabled the Pennsylvania Railroad to run its biggest turbine 23 hrs. a day for 18 months without cleaning. A drop of 5 to 15 deg. Fahr. was obtained.

The Toledo Railways & Light Co. used a 70,000 cu. ft. capacity "Spraco" to cool a 20,000 kw. turbine. Though the plant was located on a very dusty street the "Spraco" absolutely prevented dust from getting into the machine.

Another customer dropped quantities of soot in front of the air intake but never a grain of it got to the turbine.

A 15 per cent reduction in fuel cost is easy with "Spraco" equipment.

We can prove it. Will you write?

SPRAY ENGINEERING COMPANY

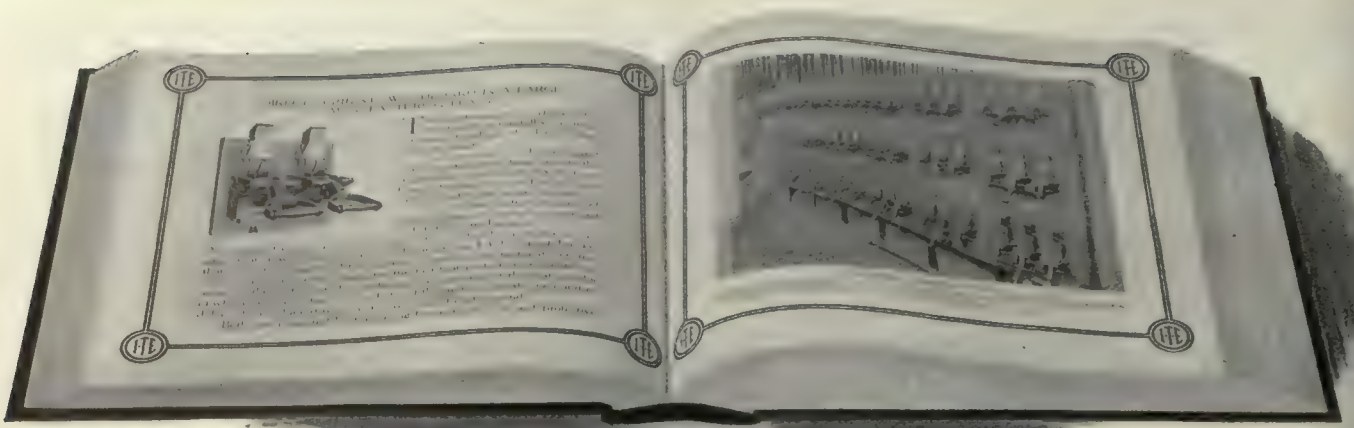
Engineers for

Spray Cooling Ponds, Irrigation Systems, Air Conditioning, Aerating Reservoirs, Air Condensers, Gas Washing, Installations.

93 FEDERAL STREET
BOSTON, MASS.

Manufacturers of

Air Washers for Steam Turbine Generators, Spray Nozzles and Spray Pond Equipments, Paint Spraying Apparatus for Bodies, Trucks and Fenders, Humidifiers, Asphalt Nozzles, Gas Washers, Park Sprinklers, Aerating Nozzles.



TYPICAL I-T-E CIRCUIT BREAKER INSTALLATIONS

Every consulting and operating engineer should secure a copy of this book.

Quite aside from its general interest, the number of important interurban and street railway switchboards shown and described can not fail to be of interest, while the descriptions of the circuit breakers for special purposes will be stimulating and suggestive to those responsible for the successful operation of large installations.

The number available for free distribution is limited. Application, therefore, should be made at once.

THE CUTTER COMPANY, Philadelphia

Standardization Begins at the Power House

The logical place to begin standardization is at the beginning of the line—the power house. Standardization of this or that part of a car which will lead to a 2 or 3 per cent saving in power consumption is all right, but should not come before the standardization of fuel and ash handling equipment, which will effect savings in some cases as great as 85 per cent of the previous handling costs, at the power house.



Tenth Street Power Plant of the T. H. I. & E. Traction Company, Indianapolis, Ind. Practically all of the important power houses of this company are equipped with Hunt Coal and Ash Handling Machinery.



Hunt double skip hoist and cable railway at Mahoning and Shenango Railway and Light Co., Youngstown, Ohio.

Hunt Coal Handling Equipment

should be your first thought when considering economy in handling fuel, reliability in service, and minimum maintenance.

Hunt Equipment has an enviable reputation for increasing the capacity or reducing the expense of getting coal under and away from the boilers of railway, light or power plants.

**It is the standard where
standard exists**

Write for our catalogs embracing every conceivable fuel or ash handling device.

C. W. HUNT CO., Inc.
West New Brighton, N. Y.

61 Broadway, New York Munsey Bldg., Washington
Fisher Bldg., Chicago

Speaking of Tendencies

~ read this ~

~ from Electrical World

Electrical Transmission and the Widening Use of Electric Service

BY DR. LOUIS BELL
Consulting Engineer

THE year's work in electrical power transmission may be described as intensive rather than extensive, involving a building up of load, extension of growth of networks, and the working out of continuity of service. There has been

~ then
read this

~ from one of our ads:

\$1,000,000 SAVED

¶ Five years ago a 2000 Kva. 66,000 Volt Substation cost complete \$12,000.

¶ Today we can build you one, using our Outdoor Switching and Protective Apparatus, at a cost of only \$6000.

¶ The Public Utilities Companies of America have already saved over a million dollars in initial expenditure by using our type of construction, instead of costly brick or concrete buildings.

¶ We are the Pioneers in the Development of Outdoor Switching and Protective Apparatus for High Voltage Transmission Lines and Outdoor Substations.

¶ We feel justly proud of our record in establishing the outdoor type of steel substation construction in America.

¶ Today our Apparatus is Standard in all Sections of this Country and in many Foreign Lands.

¶ Write us—we'll send you some mighty interesting facts on our Burke Substation Equipments.

mission systems. has been adopted for the and smaller plants in connection with order systems.

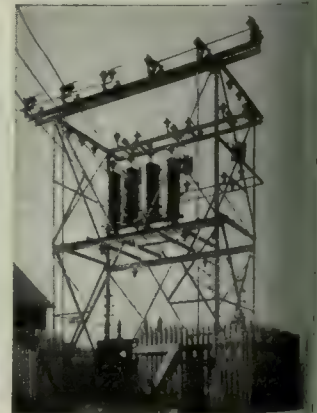
Another tendency which has been strong in the last year or so is the very extensive use of outdoor substations, with the simplest sort of air-break switches, at first put into use in Southern and Western plants where climatic conditions are not severe. They are now being unhesitatingly used in Northern climates and have shown capability of so good service that the practice will undoubtedly grow. Occasionally a shelter roof is used in connection with such stations sufficient to protect somewhat against rain and snow, but more often it is merely a case of putting big transformers in the open, just as always is done with those on the distribution lines. There is really no more serious difficulty in keeping a 100-kw. unit with its necessary protective devices in the open air than in keeping a 10-kw. transformer of the same make on a pole in front of a factory and, save where special provisions for regulation or lightning protection have to be made, the walled-in substation seems to be decreasing in popularity.

The general practice seems to be to attempt to make distribution system as simple and as nearly automatic operation as is practicable. These same not only to the hydroelectric systems of distributing lines particularly through being put in electric ap-

Experienced Engineers
Head Our
Design—Manufacture—Sales

Railway and Industrial
Engineering Company

PITTSBURGH, PA.

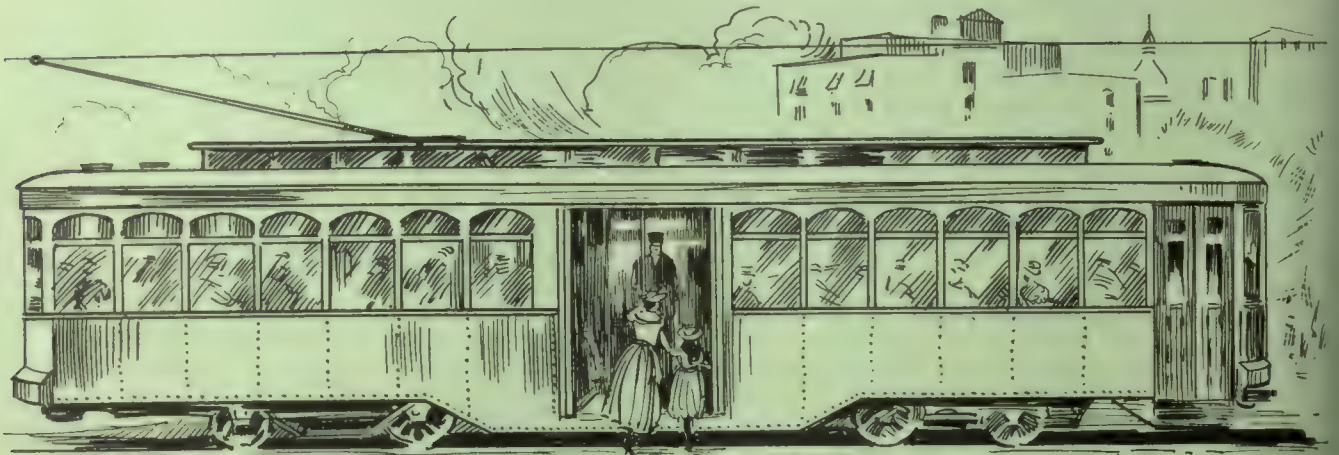


The
**GENERAL
ELECTRIC
COMPANY**
and the promotion of
**BETTER
CAR SERVICE**

The development of modern car service has been contingent upon the ability of the electrical manufacturer to embody ever-better qualities in motor, control and brake equipment.

For example, in the development of General Electric motors, the commutating pole, the self-ventilation, the tap field, the higher speed and the lower weight must not be regarded in the light of mere technical improvements, but as our response to the modern service needs of the electric railway industry.





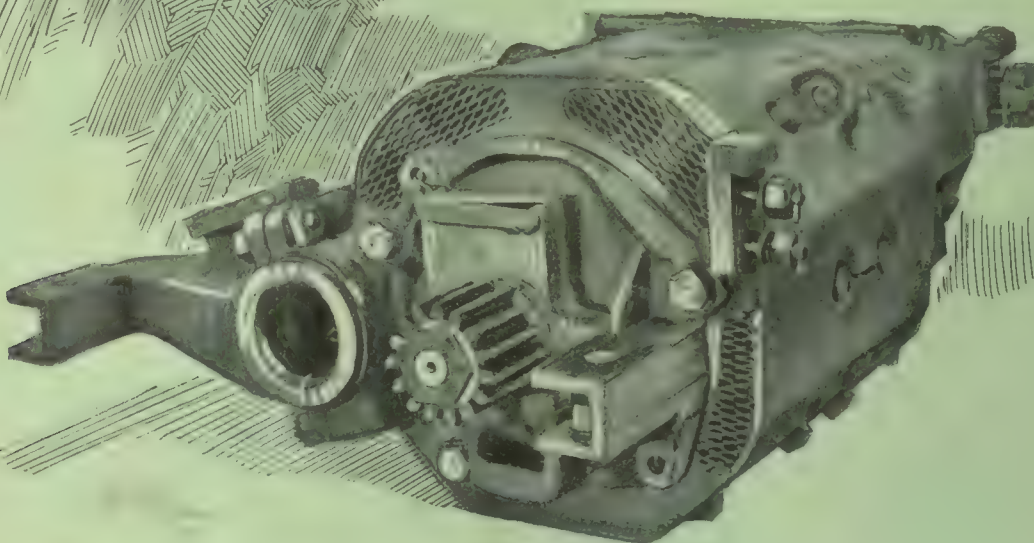
The High Car Step Abolished

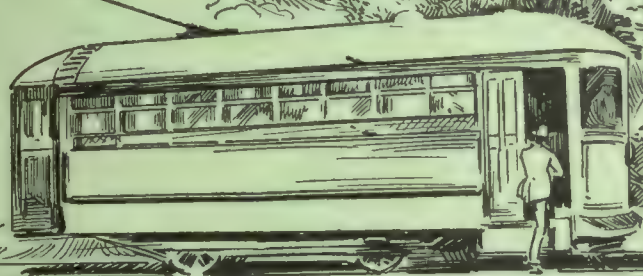
For years the high steps of electric railway cars were a source of annoyance to the public and of delay and accident expense to the railway.

The introduction in 1913 of the GE-247 motor made it possible to use a 24-in. wheel and moderate weight trucks under a car body of standard construction.

Thus were obtained the advantages of easy access and faster schedules in the simplest conceivable way—by producing a more compact, minimum depth motor.

The G-E 247 Ventilated Railway Motor





Profitable Car Service for Small Towns

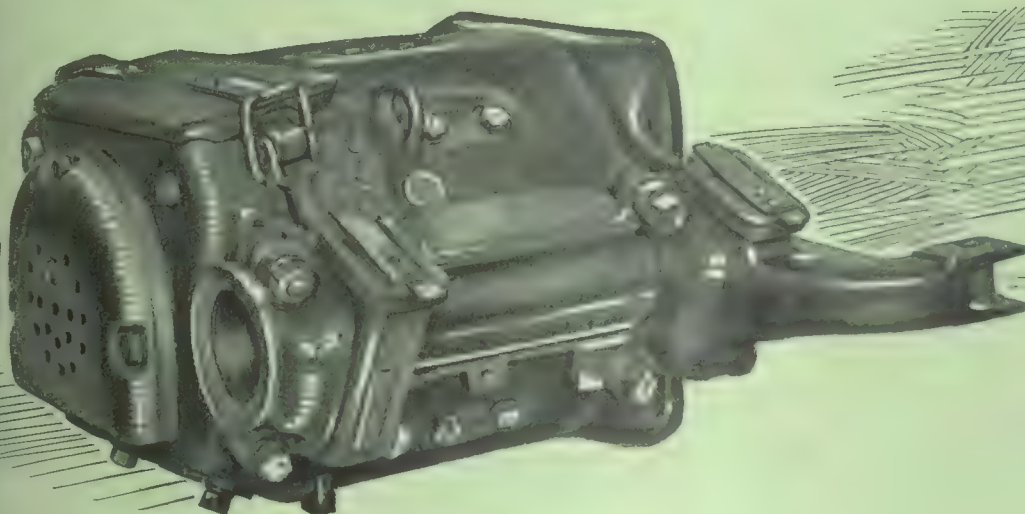
The General Electric Company has contributed in no small degree to make one-man operation successful.

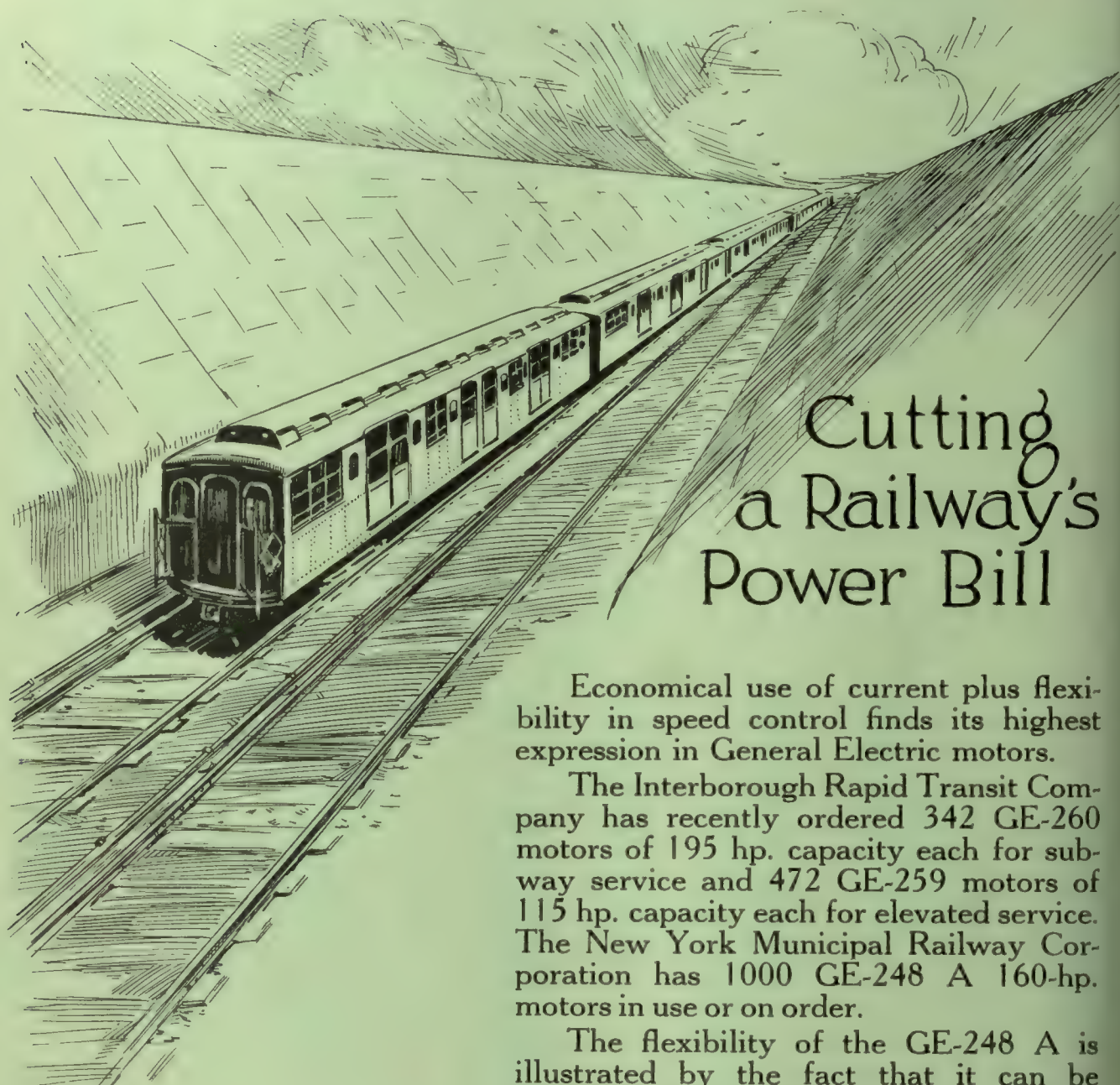
The complete motor and control equipment furnished for one-man cars in 1914 (two GE-200 motors per car) weighed 5480 lbs.

Yet within two years each of the new Stone & Webster one-man cars was furnished with a pair of GE-258 motors and accompanying control weighing only 2333 lbs.

The General Electric Company has appreciated a need of the industry and fulfilled it.

The G-E 258 Ventilated Railway Motor



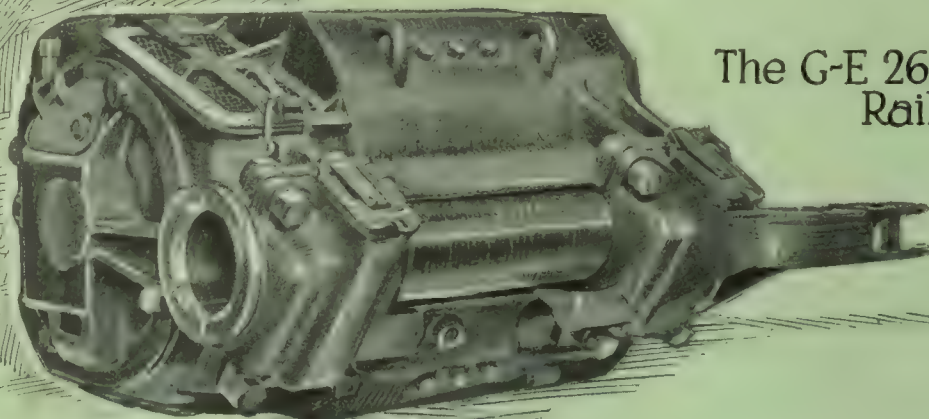


Cutting a Railway's Power Bill

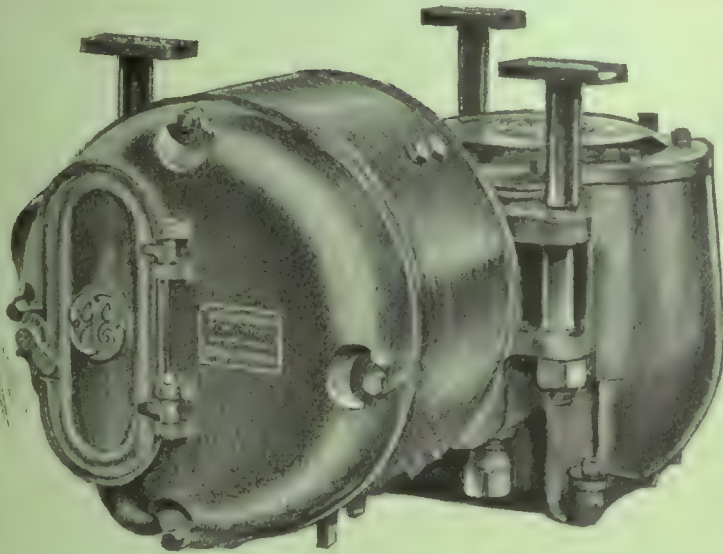
Economical use of current plus flexibility in speed control finds its highest expression in General Electric motors.

The Interborough Rapid Transit Company has recently ordered 342 GE-260 motors of 195 hp. capacity each for subway service and 472 GE-259 motors of 115 hp. capacity each for elevated service. The New York Municipal Railway Corporation has 1000 GE-248 A 160-hp. motors in use or on order.

The flexibility of the GE-248 A is illustrated by the fact that it can be used on full field to give local service at a schedule speed of 15 m.p.h., and on tap field to give express service at 25 m.p.h.



The G-E 260 Ventilated
Railway Motor



The CP-27-B
Compressor

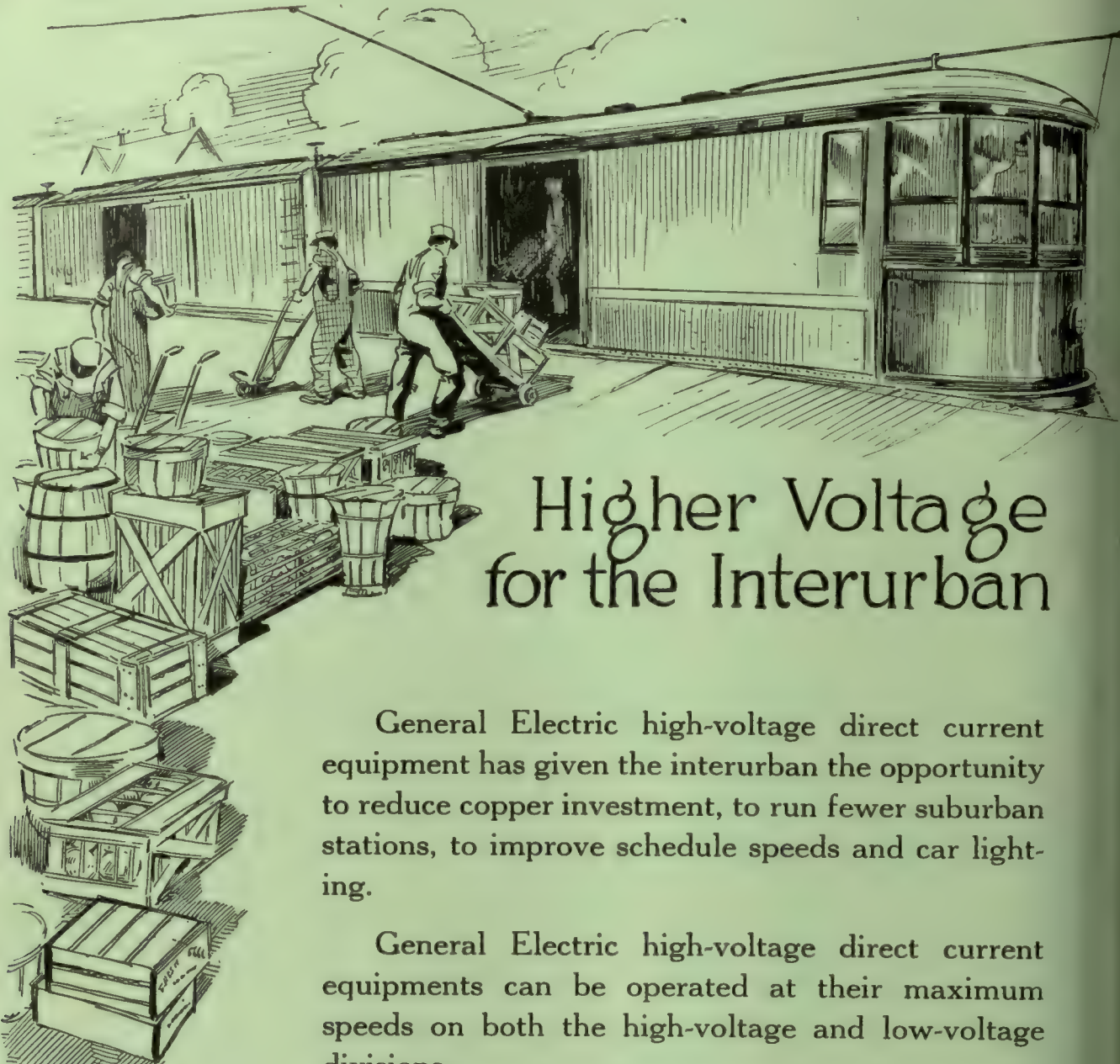
Ever-Higher Standards in Brakes and Control

General Electric air brakes and General Electric control are the logical companions of General Electric motors.

By producing the CP-27-B compressor, the most troublesome part of car equipment has been placed on the same plane of reliability and strength as the traction motor.

By producing Sprague General Electric Type PC control, the advantages of multiple unit operation—with automatic acceleration features—are made available for every class of service.



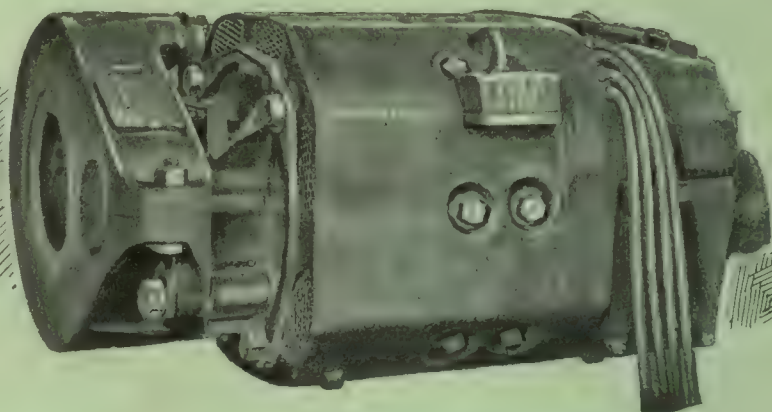


Higher Voltage for the Interurban

General Electric high-voltage direct current equipment has given the interurban the opportunity to reduce copper investment, to run fewer suburban stations, to improve schedule speeds and car lighting.

General Electric high-voltage direct current equipments can be operated at their maximum speeds on both the high-voltage and low-voltage divisions.

The G-E 259 Ventilated Railway Motor



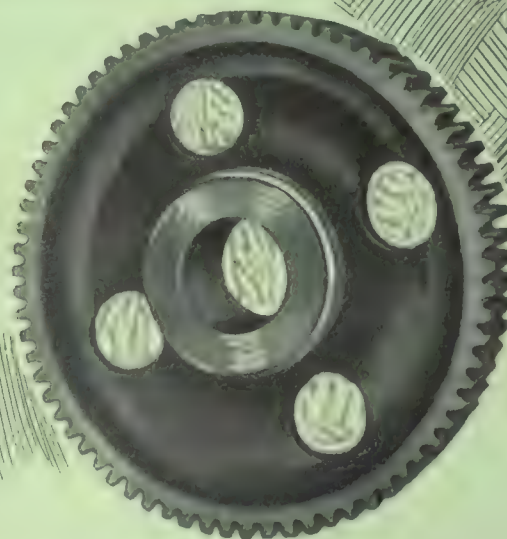


The Grade M Gear— the Universal Gear

Gears are too important a link in reliable car service to be bought merely on a price basis.

Broken gears are not only a source of costly traffic blockades but also of real danger.

In the Grade M gear, the General Electric Company has succeeded in producing a **universal homogeneous gear**—one that is equally serviceable, economical and safe on surface, city rapid transit and interurban railways.



Permanent Benefit from GENERAL ELECTRIC Improvements

To retain permanently and to the full the advantages of the General Electric equipments illustrated on the previous pages, a judicious purchase of supplies is essential.

An inferior coil, a poor brush, a badly-gaged brush-holder will cripple the best of motors. And so with the details of brake or control apparatus.

To use General Electric "Original Equipment Quality" maintenance and repair parts exclusively is fair to your equipment and most profitable to you.



6515

General Electric Company

Atlanta, Ga.
Baltimore, Md.
Birmingham, Ala.
Boston, Mass.
Buffalo, N. Y.
Butte, Mont.
Charleston, W. Va.
Charlotte, N. C.
Chattanooga, Tenn.
Chicago, Ill.
Cincinnati, Ohio

Cleveland, Ohio
Columbus, Ohio
Dayton, Ohio
Denver, Colo.
Des Moines, Iowa.
Duluth, Minn.
Elmira, N. Y.
Erie, Pa.
Fort Wayne, Ind.
Hartford, Conn.
Indianapolis, Ind.

General Office: Schenectady, N. Y.

ADDRESS NEAREST OFFICE

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Kansas City, Mo.
Knoxville, Tenn.
Los Angeles, Cal.

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Memphis, Tenn.
Milwaukee, Wis.
Minneapolis, Minn.
Nashville, Tenn.

New Haven, Conn.
New Orleans, La.
New York, N. Y.
Niagara Falls, N. Y.
Omaha, Neb.
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Pittsburgh, Pa.
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Richmond, Va.
Rochester, N. Y.

St. Louis, Mo.
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Seattle, Wash.
Spokane, Wash.
Springfield, Mass.
Syracuse, N. Y.
Toledo, Ohio
Washington, D. C.
Youngstown, Ohio

For Michigan Business refer to General Electric Company of Michigan, Detroit.
For Texas, Oklahoma and Arizona business refer to Southwest General Electric Company (formerly Hobson Electric Co.), Dallas, El Paso
Houston and Oklahoma City. For Canadian business refer to Canadian General Electric Company, Ltd., Toronto, Ont.

Electric Railway Journal

Annual Convention Section



The Development of the Electric Railway Car

GREATER changes have been introduced in the design and equipment of electric railway passenger cars during the last five years than in any other similar period in electric railway history. Many radical experiments have been made—especially in 1912, which saw the first extended attempts to break away from the till-then standard car body with a high floor and end platforms—and the influence of these innovations appears in the practical revolution in car design that is under way at the present time. So great a variety in apparatus and arrangement has, in fact, been set before the industry that there is obvious need to summarize recent developments in the art and, by taking stock

of the existing situation, to select those things which give the most promise of permanent improvement in efficiency and sufficiency in operation.

In the subsequent paragraphs, therefore, there have been collected data covering the major features of cars that may be considered as representative of the present trend in construction. The illustrations that accompany the text have been arranged to show in most cases dimension drawings as well as photographic reproductions, and when the two are shown for any particular car both appear upon the same page over a single title. A comparison of these various cars will, no doubt, display to good advantage the great divergence in ideas that has been a feature of recent practice in design and equipment.



Among these developments, however, there stand forth three general characteristics which constitute very definite tendencies in modern car design and which, therefore, must receive primary consideration. These apply not only to cars for city service, but to those used under high-speed operating conditions as well. They are, first, provision for the greatest possible convenience to the riding public; second, light weight, and third, steel construction.

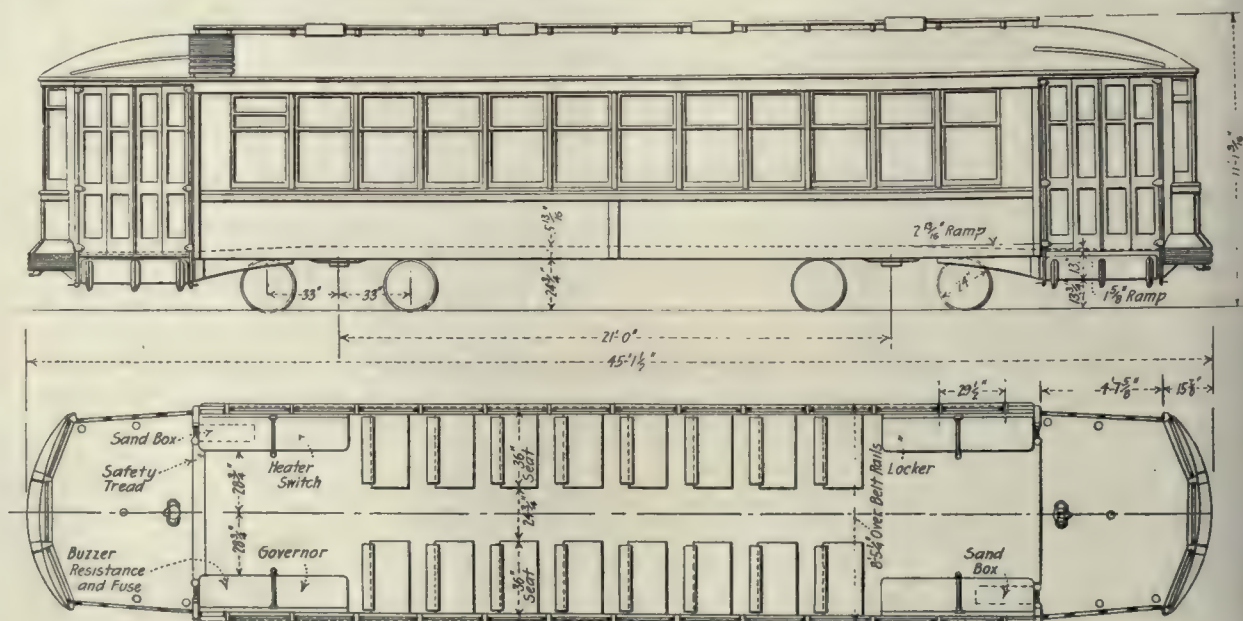
PUBLIC CONVENIENCE

The first of these general characteristics appears most prominently in the remarkable access of popularity that has been granted within the past year to the "low-floor" principle for city cars. During 1915, the representative orders for cars with low floors totaled actually greater than those for city cars with floors at the originally common height. Here the underlying idea has been to relieve entering passengers of the labor of mounting excessively high steps, thus decreasing passenger interchange time, but it might well be noted that the low-floor designs also offer very distinct advantages in weight reduction.

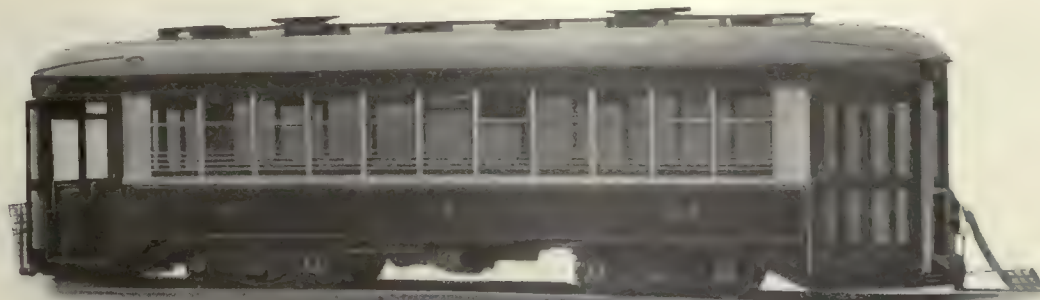
The feature of providing for public convenience

appears also in the growth of the center-door idea, or of modifications of it, that has taken place since 1912, this being exemplified by the fact that in the total number of cars built during 1915 for representative interurban and city services, roughly one-third made use of the center door in some form. Each one of the center-door designs has been based inherently on greater public convenience, the aim having been in all cases to provide easy access to the car body, greater seating capacity and shorter average distances between the entrance and exit and the seats. These qualities were realized with the plain center entrance as originally brought out, but in city service, unforeseen difficulties have since made their appearance, and here, again, the problem of public convenience has impelled designers to make changes, resulting in modifications of the plain center entrance which have been common to practically all recent motor cars of this type.

In interurban service the plain center entrance does not suffer from the same handicaps that it carries in city service, and its development has been along lines that are quite similar to those originally suggested. For rapid transit equipments a modification of the center-entrance principle, which con-



Flush-Platform, All-Steel, Low-Floor Car of Buffalo & Erie Traction Company



sists in having three doors in each side of the car and which has definitely become standard practice in such service, has been developed solely to provide greater ease and rapidity in loading and unloading.

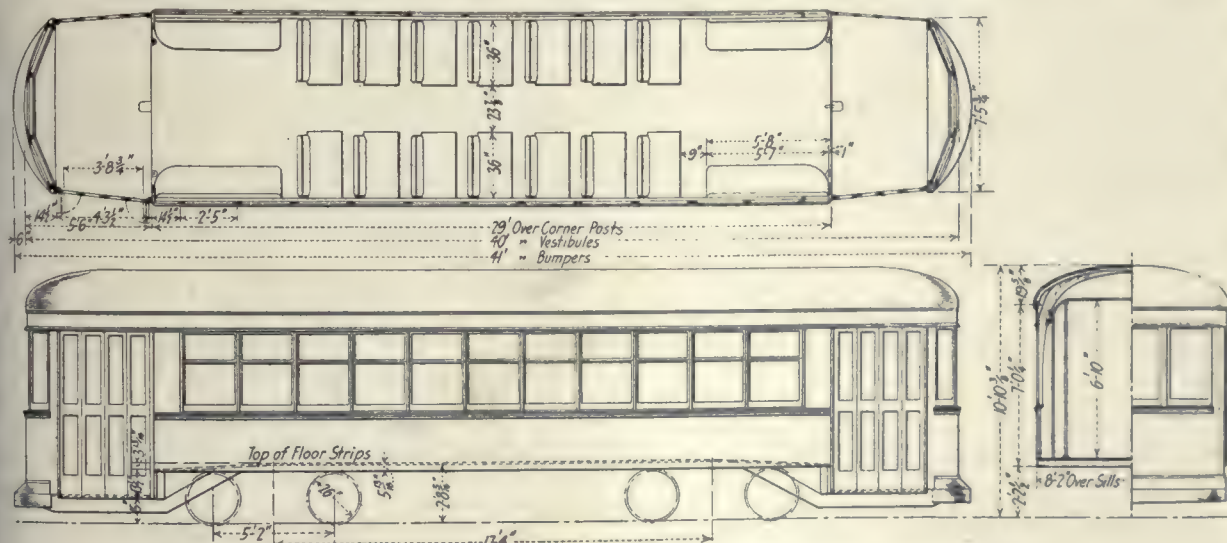
To the same end has been the practically universal adoption of the prepayment system of fare collection in city service. With this has come the fully-inclosed platform having folding doors and steps to eliminate boarding and alighting accidents—a most important development. At the same time, but for converse reasons, the open car has become moribund. This may be said, as well, of the fully-convertible car, although the reasons for its demise are structural rather than operating, and hence the semi-convertible designs, or those in which the sash may be removed or raised completely out of the way to leave a clear opening above the belt rail, serve as the only examples of equipment that has been constructed especially for summer service within the last two or three years. To public convenience, also, the trail car has been sacrificed in so far as regular city service is considered, the riding public being unwilling to put up with the decreased schedule speeds necessitated by the increased number of stops made by the double units of a two-car train. However, the skip-stop has made the trailer

commercially possible in several cities, and for this reason it is not to be expected that the field for the trail car is altogether closed.

Similarly, the double-deck car, which was revived in 1913 with the expectation that it might aid in solving the service problem in congested districts, has been found to be too susceptible of dragging schedules, and at the present time its direct antithesis, the one-man car, has developed popularity to a certain degree. Judging by the existing indications, however, there is little reason for supposing that, in the majority of localities, the public may be better served by cars having capacities widely different from those now common in city service. But in any event, as may be seen from the foregoing brief résumé of the status of development during the last five years, the factor of public convenience is going to dominate absolutely the success or failure of any general type of car.

LIGHT WEIGHT A UNIVERSAL TENDENCY

Next to convenience for the riding public, the characteristic of most importance that is common to modern electric railway cars is light weight, the extent of this tendency being shown by the weight reduction of at least 20 per cent that has taken



Low-Floor, Drop-Platform Design Adopted by Wilmington & Philadelphia Railway

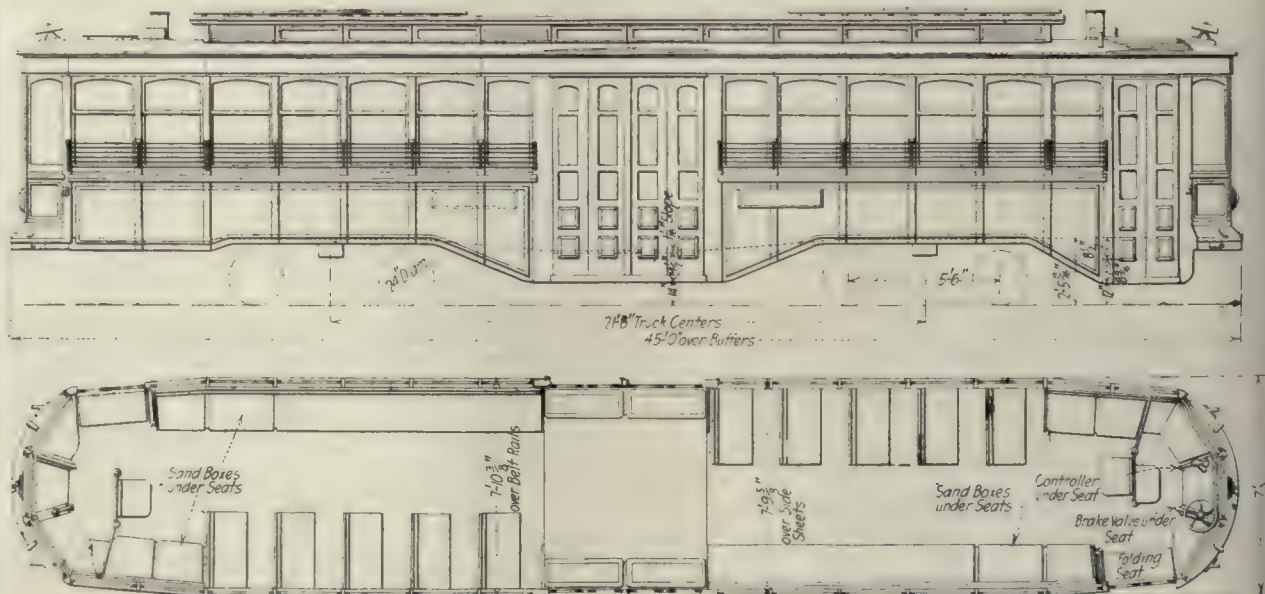


place during this same five-year period in the case of city cars of customary size, or say, 45 ft. long. The agitation in favor of light cars, of course, antedates this period by several years, and recognition has long been given generally to the savings effected in energy consumption, maintenance and (in the case of steel construction) first cost. Yet the definite establishment of the light car as a practical accomplishment was almost coincident with the inauguration of the several radical new designs of the year 1912, all of the original low-level cars being characterized by weights which were then considered extraordinarily low. The Brooklyn center-entrance car, for example, weighed about 38,000 lb., and the New York "stepless" design about 36,000 lb., while the modified Pittsburgh "low-floor" car, in its final form with center-entrance and end-exit doors, weighed 35,600 lb. The end-entrance Chicago Railways car of the following year weighed 35,350 lb. Subsequently there were brought out the end-entrance New Orleans car weighing 35,580 lb., the low-floor, California-type car of the United Railroads of San Francisco, weighing 33,500 lb., the Des Moines front-and-center-door, single-end

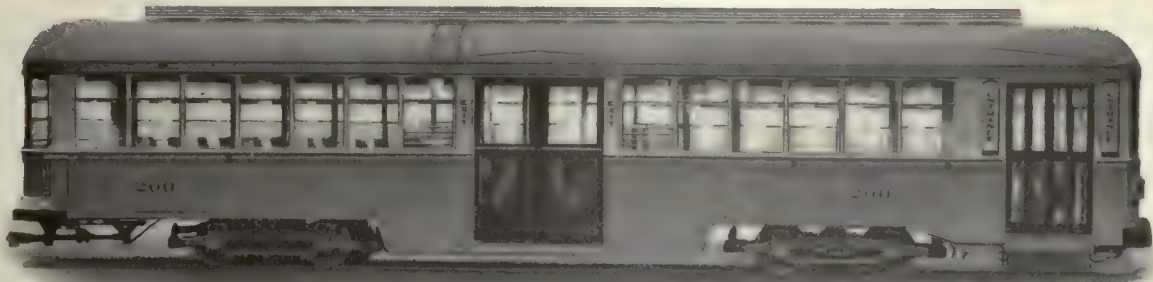
car weighing 33,000 lb., all of these being listed in Table I. Among the still more recent equipments appear the Buffalo & Erie flush-platform, two-motor, 45-ft. car which has a scale weight, when equipped for double-end operation, of 31,750 lb., and even this figure has been passed by both the four-motor, 41-ft., double-end car of the Wilmington & Philadelphia Traction Company, which has a scale weight of 30,540 lb., and the four-motor, 50-ft. single-end, Rochester car weighing 30,570 lb.

Some of this rather remarkable saving in weight has been effected by improvements in the design of body and by the increasing use of steel construction. However, the major part has come through the use of small wheels with trucks and motors of correspondingly reduced size. The five last-mentioned cars, for example, are all equipped with wheels of either 24-in. or 26-in. diameter. Three of them have the 30-35-hp. "low-floor" motor that was brought out originally on the Pittsburgh Railways in 1912, and the Rochester and Wilmington-Philadelphia cars have a new type of small motor rating 21-25 hp. and weighing only 840 lb.

The double-truck car is, of course, so much more



Original Type of Pittsburgh Low-Floor Car with Center Entrance and Auxiliary Front-Exit Door



numerous in city service than single-truck designs that its trend of development may fairly be said to represent the tendencies of the industry. Nevertheless, the modern single-truck car has acquired, of late, a material increase in popularity, and to make the record complete Tables II and III have been prepared, these showing the major features of a number of recent single-truck cars and of several of the ultra-light designs that have come into prominence in connection with one-man operation.

For cars in interurban service the opportunity for such direct weight comparisons as the foregoing is very limited. This is largely due to material variations in width of car body and in motor equipment, and also because of the practical impossibility of drawing any definite line of demarkation between interurban operation and suburban runs on the one hand and electrified steam railroad service on the

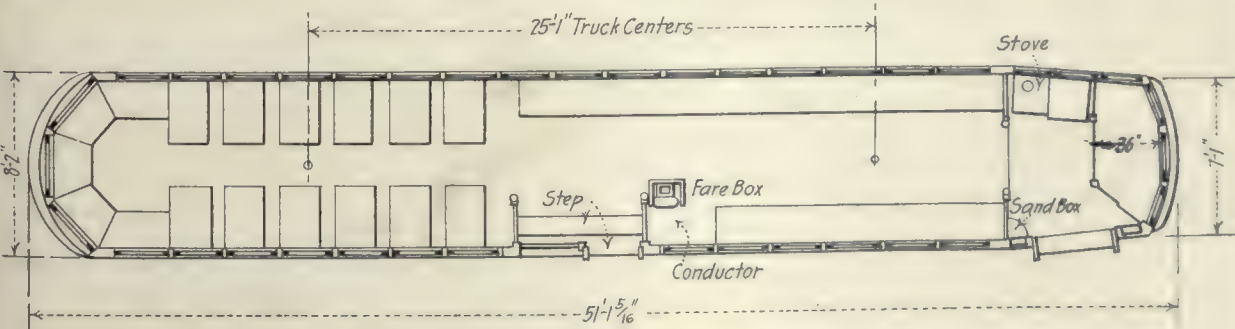
other. Suburban equipment may be said to include cars up to about 50 ft. in length which are capable of operation up to 50 m.p.h. and which have, generally speaking, no compartments or divisions of the car body. Good modern examples appear in the 51-ft., center-entrance cars of the Washington & Virginia Railway and the Cleveland & Erie Railway, although the latter has a two-compartment body. These cars weigh respectively 58,000 lb. and 56,130 lb., and while the figures are considerably greater than would be expected for city cars, they are also much below those that would be considered possible for normal interurban service, one reason for the latter difference being the use of four 50-hp. motors on each of the cars in question and a definite limitation of maximum speed. On the border line of interurban service may be cited the Cleveland & Eastern, 54-ft., end-

TABLE I—WEIGHTS AND DIMENSIONS OF RECENT DOUBLE-TRUCK CARS FOR CITY SERVICE

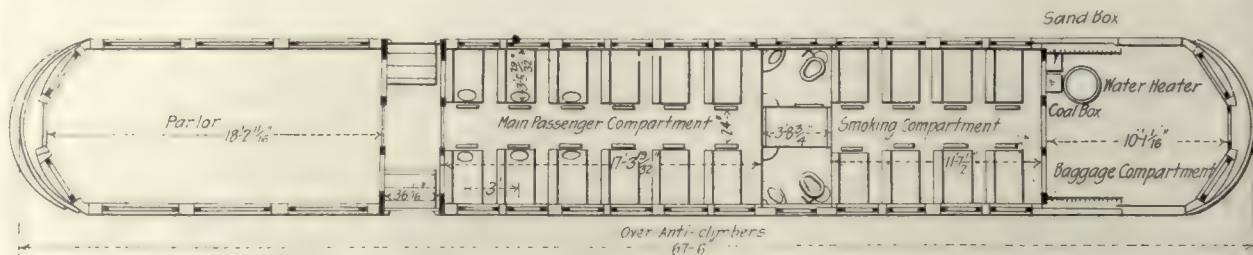
	Weight, pounds	Length over bumpers, ft.-in.	Seating capacity, body	Wheel diameter, in.	Motors	Remarks
Wilmington & Philadelphia	30,540	41-0	44	26	Four 21-25 hp.	Drop platforms.
Rochester	30,570	50-0	52	26	Four 21-25 hp.	Front-entrance, Center-exit.
Buffalo & Erie	31,750	45-1 1/2	48	24	Two 30-35 hp.	Flush platforms.
Des Moines	33,000	45-0	51	24	Four 30-35 hp.	Front and center doors, Single-end.
San Francisco	34,180	47-0	50	24	Four 30-35 hp.	California type, End-entrance.
Chicago Railways	35,358	48-5	53	32	Two 50-60 hp.	Drop platforms.
New Orleans	35,580	47-8	52	30	Two 55-65 hp.	Drop platforms.
Pittsburgh	35,600	45-0	60	24	Four 30-35 hp.	Center-entrance, Front-exit.

TABLE II—WEIGHTS AND DIMENSIONS OF TYPICAL SINGLE-TRUCK CARS

	Weight, pounds	Length over bumpers, ft.-in.	Seating capacity, body	Wheel diameter, in.	Motor horse-power, hp	Wheel-base, ft.	Trucks
Union Ry., New York City	24,000	35-0	37	24	30-37	10	Non-Parallel-Axle.
Bangor, Me. Cent. Ent.	26,000	33-0	42	28	33-40	15	Single-Radial-Axle.
Toronto Civi Railway	29,400	34-8 1/2	32	33	40-50	8	Rigid-Axle.
Albany, Marshall, Texas	22,000	33-4	32	30	33-40	8	Rigid-Axle.
Newport News Cent. Ent.	23,900	33-5	32	33	40-50	8 1/2	Rigid-Axle.
Austin, Texas	20,850	35-0	44	26	30-35	15	Single-Radial-Axle.
Reading	24,000	35-1	36	33	25-30	9	Non-Parallel-Axle.
	22,000	31-7	32	33	30-35	8	Rigid-Axle.



Cleveland Front-Entrance, Center-Exit Design with Prepayment Space Extending Over Forward Half of Body



Four-Compartment Car of Michigan Railway Designed for Fast Limited Service Over Long Runs

entrance, two compartment car which weighs 59,400 lb. when fully equipped with four 65-hp. motors, and following this is the Cleveland, Fostoria & Findlay three-compartment car, which is 56 ft. long and weighs 68,000 lb., the equipment being four 75-hp. motors.

Modern cars that may be definitely classed as interurban are grouped in accordance with their weights in Table IV which, at first sight, gives the impression that the weight of modern interurban equipment lies within the close range of between 80,000 lb. and 85,000 lb. To the extent that this table demonstrates the passing of the day of the 50-ton and 60-ton interurban car, the impression that it conveys may be considered as correct. In general, however, the close agreement of these car weights must be ascribed largely to chance. The motors on the various cars, for example, range in capacity from 75 hp. to 160 hp., making a difference on this score alone of about 6500 lb., and although the heaviest car is also the longest and the widest one, the car next to it in the list is the narrowest, the reduced width making a difference equivalent to about 4000 lb. in weight. The sum of these two figures makes a possible variation that is considerably in excess of the entire range of weights appearing in the table, and if consideration should be given to these variables and to the other factors that might influence a comparison, the arrangement of the list would be completely changed. Judged on the basis of weights of older interurban cars, however, the table shows very definitely that there is a trend toward lighter equipment in the case of interurban railways.

However, modern cars that weigh more than 50 tons are being built, the field for them appearing in heavy electric traction, or electrified steam rail-

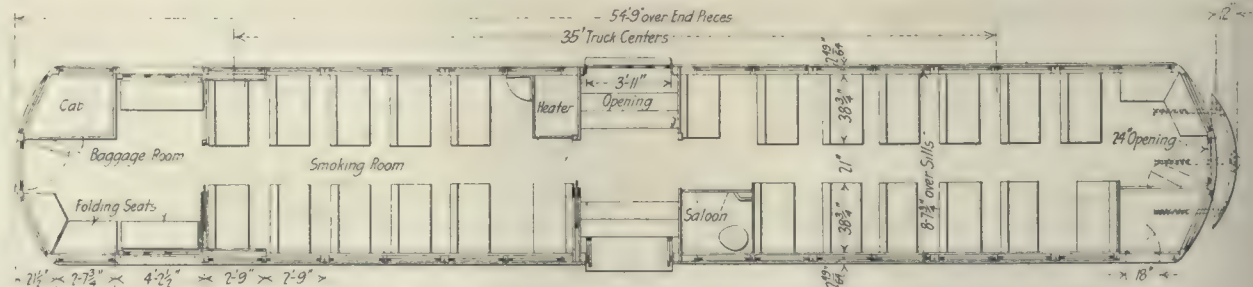
TABLE III—WEIGHTS AND DIMENSIONS OF ULTRA-LIGHT CARS FOR ONE-MAN OPERATION

	Weight, pounds	Length over bumpers, ft.-in.	Seating capacity body	Wheel diameter, in.	Motors	Rigid wheel-base, ft.	Remarks
Puget Sound	10,000	22-10	29	24	Two 21-25 hp.	8	Single-End.
Tucson, Ariz.....	11,000	27-6	28	26	Four 7 hp.	8	Truckless, Loose wheels.
New York Railways...	12,200	28-9	34	21	Two 8 hp.	7 1/2	Center-entrance, Storage battery, End Platforms.
Sedalia, Mo.	13,900	30-1	28	24	Two 21-25 hp.	9	End Platforms.
Austin, Texas.....	14,300	30-1	28	24	Two 21-25 hp.	8 1/2	End Platforms.

road service. As mentioned previously, there is no definite line to be drawn between this service and the true interurban, and, as a matter of fact, the Lake Erie & Northern car appearing in the list of interurban equipments is really operating over an old steam line. Generally speaking, the difference between the two classes of equipment is one of length, width and buffing strength. While interurban cars seldom are much more than 60 ft. in length and 9 ft. in width, the steam railroad standards call for lengths between 65 ft. and 70 ft. and

TABLE IV—WEIGHTS AND DIMENSIONS OF TYPICAL INTERURBAN CARS

	Weight, pounds	Length over bumpers, ft.-in.	Width over belt rails, ft.-in.	Seating capacity	Rating of motors.	Type of entrance
Lake Erie & Northern.....	80,125	59-7	9-4	70	85 hp.	End
Annapolis Short Line.....	80,300	55-0	8-9	52	75 hp.	Center
K. C. C. & St. J.....	81,000	58-0	9-0	66	125 hp.	Center
Wilkes-Barre & Hazleton.....	81,900	54-3 1/2	9-6	56	160 hp.	End
Union Traction of Indiana.....	85,600	61-0	8-9	56	110 hp.	End
Salt Lake & Utah.....	85,890	61-8	9-6	66	115 hp.	End



Center-Entrance Interurban Design for Annapolis Short Line



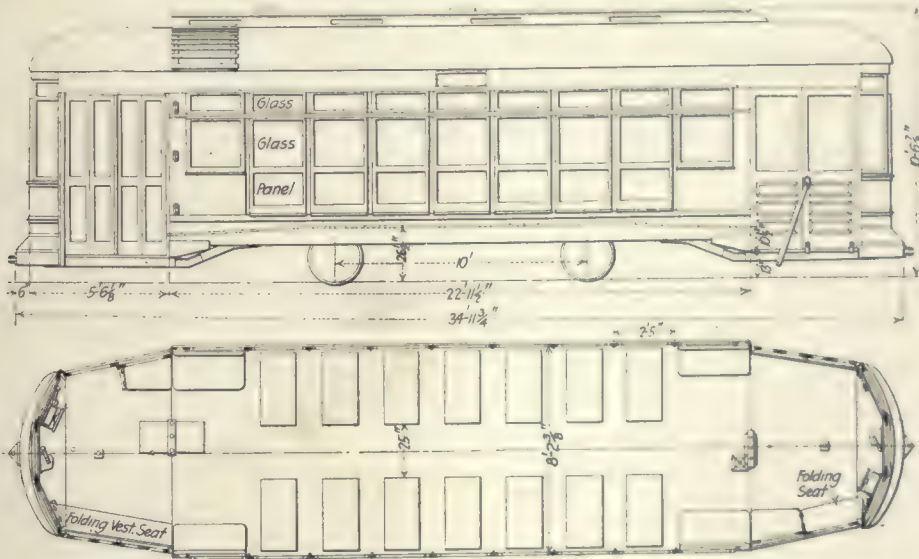
for over-all widths that are in the vicinity of 9 ft. 6 in.

In consequence, the modern cars in services that may properly be classed as heavy electric traction are markedly heavier than interurban cars, even though they may be designed with the maximum of skill and care for details. An example will be found in the cars of the New York, Westchester & Boston Railway. These are 70 ft. long, seat seventy-eight passengers and weigh 119,000 lb. including 24,500 lb. of single-phase electrical equipment which is required with the two 145-hp. motors that are used. The motor cars for the Long Island Railroad are somewhat shorter, being only 64 ft. long, and they seat seventy-two passengers and weigh 107,100 lb., including two 215-hp. d.c. motors and other electrical equipment that weighs, all told, 19,600 lb. The latter cars have been duplicated, except for the substitution of single-phase equipment, on the Philadelphia-Paoli electrification of the Pennsylvania Railroad.

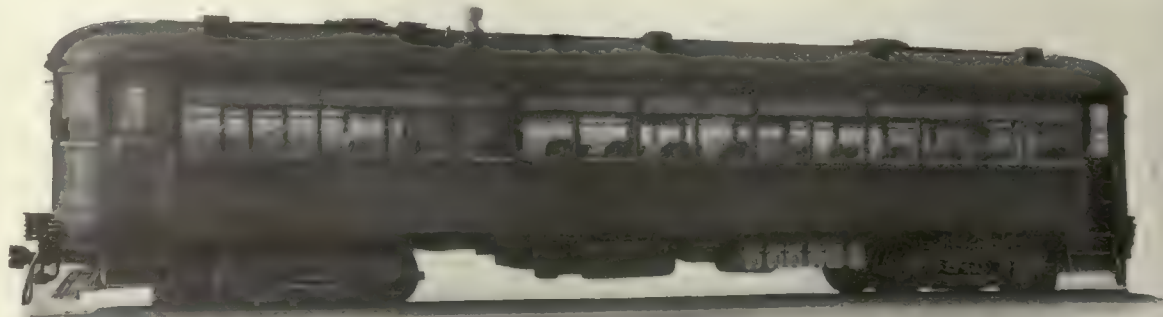
As opposed to the reductions in weight that appear in the cases of recent city and interurban cars, the weights of rapid transit cars operated in elevated service have varied but little. One very

obvious reason for this has been that old elevated cars were constructed practically without regard for rigidity and only with the aim of producing the lightest possible structure. The 1915 all-steel car of the Chicago Elevated Railroad, for example, is 48 ft. long and weighs 70,500 lb., and these figures are practically duplicated in the 1909 all-wooden design. The latter, however, had neither center doors nor any margin of strength, both of which features are possessed by the more recent car. In the case of subway equipment, the very recent New York Municipal Railways car with a length of 67 ft., a width of 9 ft. 9 in. and a weight of 85,000 lb., has provided a marked decrease in unit weight in comparison with the earlier 51-ft. subway car of the Interborough Rapid Transit Company, which has a width of only 8 ft. 6 in. but has a weight of 77,900 lb. The 1912 subway car of the Boston Elevated Railway, however, did not differ very materially from the New York Municipal car, having a length of 69 ft., a width of 9 ft. 6 in. and a weight of 85,900 lb.

The establishment of light weight as a characteristic of modern car design has been made possible to a large extent by the introduction of steel



Union Railway's Low-Floor Design with Non-Parallel-Axle Truck



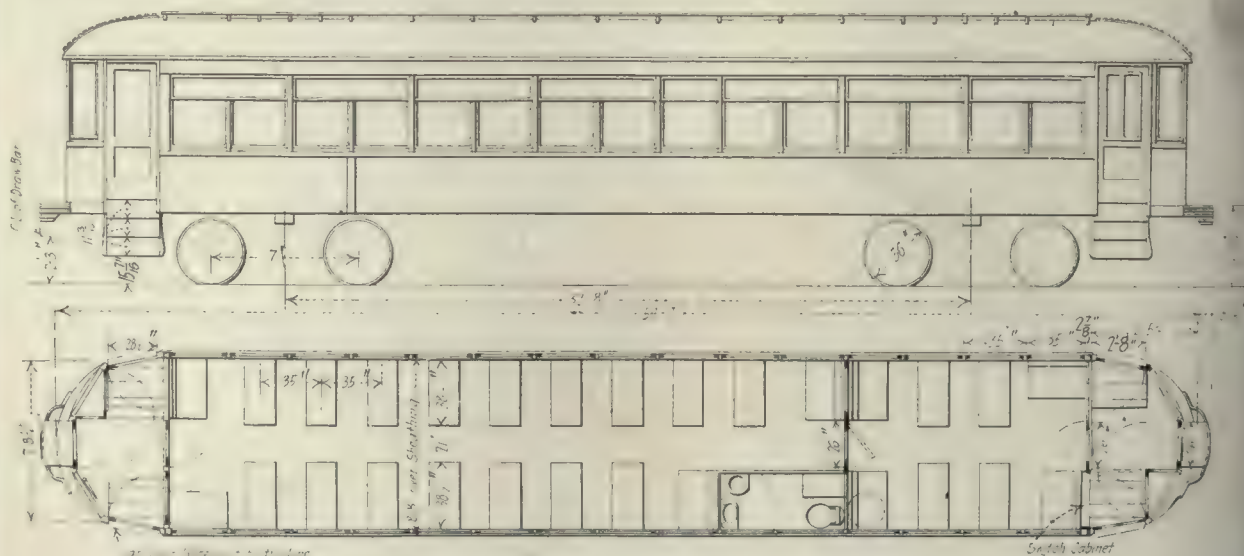
construction, and the latter feature is at the present time practically universal in all representative cars. Without exception, every one of the high-speed cars mentioned in Table IV is built throughout of steel, and of the eight representative city cars mentioned in Table I on account of their low weight, no less than five are of all-steel construction, wherein the framing, posts, carlines and letterboard, at least, are of steel, and in several cases the roof sheathing and floor sheathing as well. The remaining three city cars in the list are of semi-steel construction, in which steel is used up to the belt-rail and wood above that point.

STEEL CONSTRUCTION

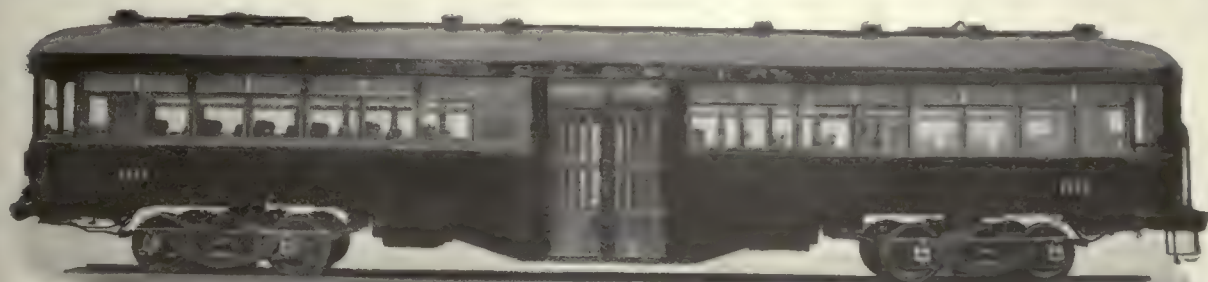
For city cars, the development of all-steel construction, as opposed to semi-steel, has been remarkably rapid, the all-steel city car having been almost unknown four years ago. In the case of high-speed service, and especially for rapid transit operation, the development has been longer under way, and all-steel construction is now almost invariably used. This has come about presumably because in no other way but by the use of an all-steel design can the necessary beam strength be

provided between the long truck-centers of high-speed cars without absolutely going counter to the modern demand for light weight. In addition, the problem of providing sufficient rigidity of structure to withstand the racking due to high speed is answered satisfactorily by the use of steel throughout.

There is, of course, a reason for this characteristic of modern car design. With cars of equal strength, an all-steel construction will involve appreciably less weight than will one of wooden construction, and since low weight is recognized as a feature of vital importance, all-steel construction follows as a corollary. The semi-steel car, as ordinarily constructed to-day, is approximately of the same weight as a similar all-steel design, so that, generally speaking, the use of steel throughout effects a saving only in the lower maintenance cost that is due to the inherently greater strength of the all-steel construction. As compared with all-wooden cars, the superior strength of an all-steel modern design is especially marked. Even without this advantage in favor of steel, however, it is safe to say that the recent change from wooden to steel construction would have taken place with-



Chicago, North Shore & Milwaukee Railway's Equipment for Heavy Interurban Service



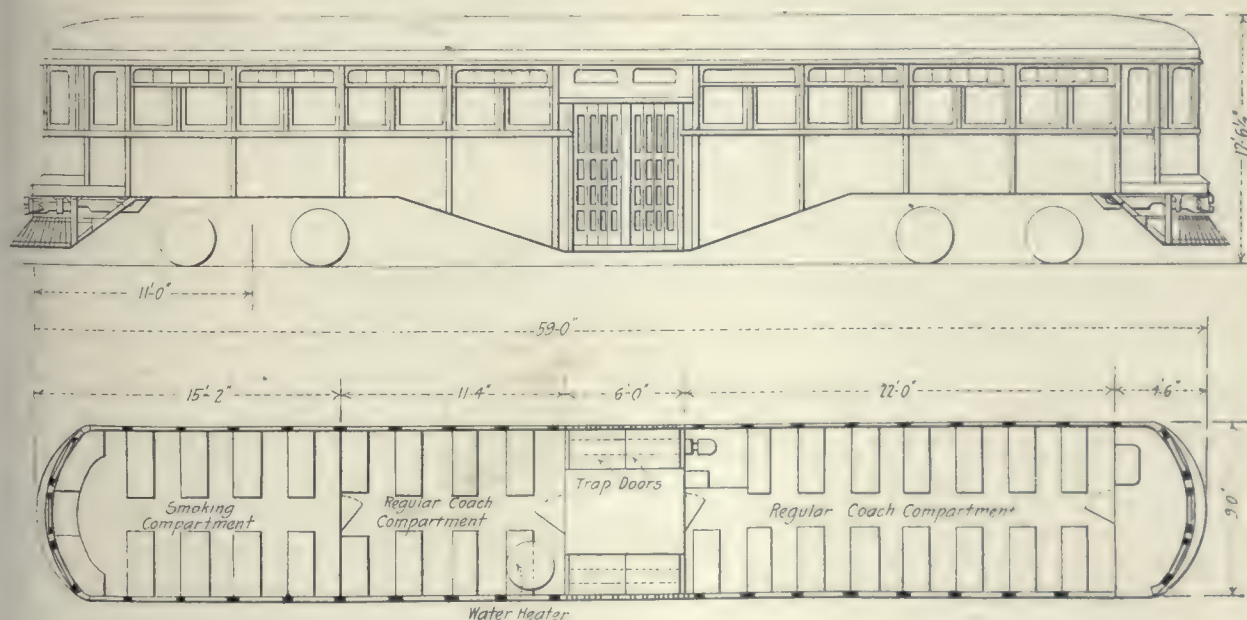
out regard to the relative structural merits of the two materials, simply because the supply of suitable timber is rapidly becoming exhausted and the inevitably higher price would have been certain eventually to make its extended use a commercial impossibility.

Estimates of car builders as to the saving in weight effected by a steel car built to give a degree of strength equal to that of any particular wooden car range from 5 per cent to 15 per cent. It is considered, moreover, that with two strictly comparable cars, one built of wood and one of steel, the steel car will have a materially greater life because of the tendency of wood to rot at the mortises and tenons.

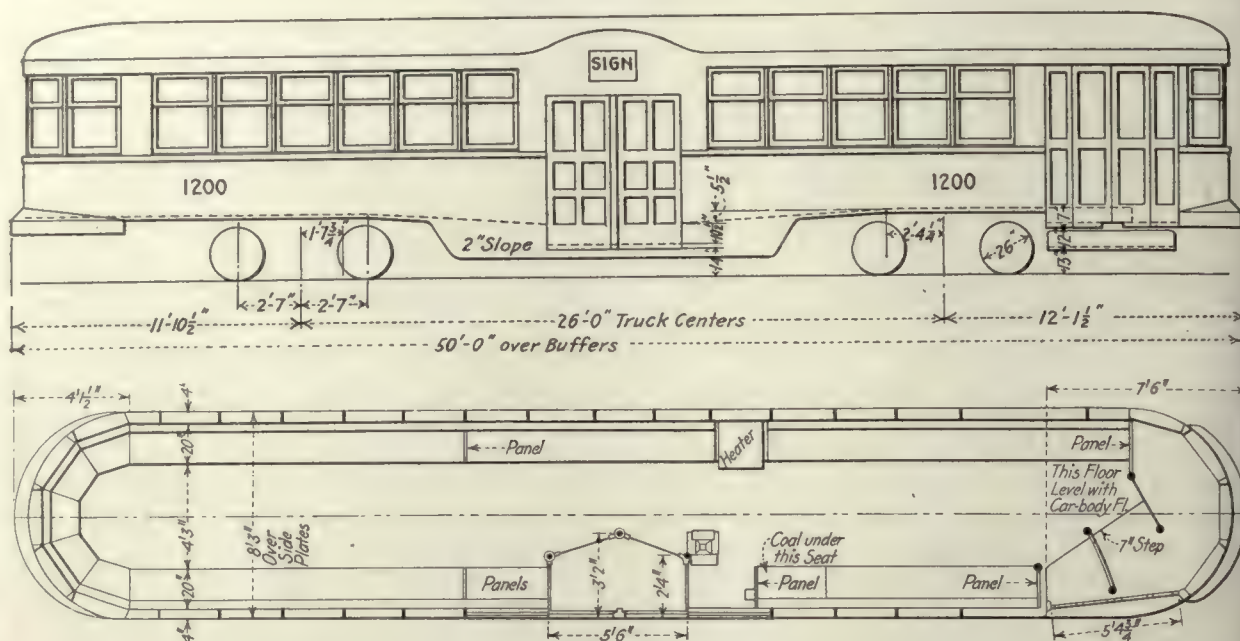
The first costs of similar cars built of wood and of steel under average conditions seem to be approximately equal, or perhaps with a slight difference in favor of steel construction, as estimates of car builders on this point range from zero to 3 per cent. Unfortunately, no direct comparisons of cost are available. This is largely because of the fact that when any railway has decided to adopt steel construction, either throughout or in part, the design of the new cars has been changed sufficiently

to prevent them from being directly compared with the older ones. Another consideration is that the cost of a wooden car varies materially in accordance with the weight or general character of its construction. For example, the cost of the labor involved in the framing of a wooden car that is designed with heavy timbers is considerably less in proportion to the cost of the material than it would be if the car were constructed with the lightest possible timbers and with the weight reduced to an absolute minimum.

This difference may easily involve an increase of 20 per cent in the pound price of very light wooden cars over those of the old-style heavy construction, so that there may be little difference in the total cost of the complete car. With steel, however, the pound price remains almost constant, and a light steel car will cost proportionately less than one of the same general dimensions but constructed with heavier steel members, the reason being that the labor cost of fabricating steel bears an almost direct ratio to the number and size of rivets required to hold the various timbers together. This condition appears in specially marked form when the weight of the car is reduced to the extremes



High-Speed Interurban Car of Kansas City, Clay County & St. Joseph Railway



Front-Entrance, Center-Exit Design with Low Floor as Adopted in Rochester

that are considered permissible for city service, and exceptionally light cars of steel may be made as much as 10 per cent lighter than the wooden ones at a cost that is actually lower by 6 or 8 per cent.

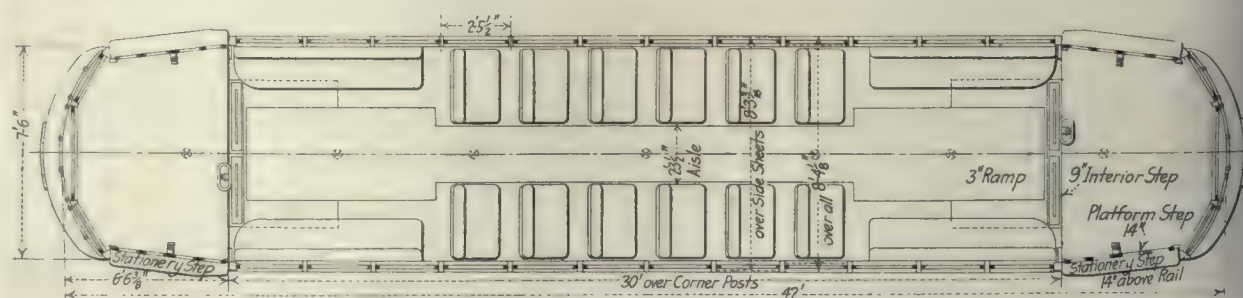
MODERN TENDENCIES IN CAR EQUIPMENT

The foregoing outline of the present status of the three major developments in car-body design points to a fairly definite set of characteristics for the modern representative car. In brief, these characteristics will include, in any event, an all-steel construction with a weight of but little more than 30,000 lb. for a 45-ft. body in city service, the latter calling in all cases for a low-floor design and, possibly, also for center doors in modified form. For interurban service a weight of 80,000 lb. for a 60-ft. body may be considered representative, and there is much evidence in favor of the plain center-door arrangement, even though this is by no means in universal use at the present time.

Representative modern equipment for the car displays a much more definite establishment of new practice than that which applies in the case of the car body alone. For city service the introduction of the low floor has brought several new designs of

motor in sizes such as 20-25 hp., 30-35 hp. and 33-40 hp., all of which may be used with at least a 26-in. wheel, and for the same reason 24-in. and 26-in. wheels have become the rule, together with axles and trucks of correspondingly reduced size and weight. All of the new low-floor motors, together with the other recent designs of larger capacity, have been characterized by the use of interpoles to improve commutation, as well as ventilation to increase capacity, these two features alone reducing motor weights in the order of 30 per cent for a given rating. At the same time the use of field control and non-rheostat control for four-motor equipments have become practical possibilities that are capable of saving some 10 per cent of the current normally used in propelling a city car.

Other exterior car equipment that may be classed as representative of modern tendencies appears in the emergency feature for the now almost universally used straight-air brake, and as a result of the presence of air on so many city cars there has come the pneumatically controlled door and even air-operated fenders and sanders. Truck design also has been affected to a considerable extent, at least in regard to dimensions, by the introduction of the



Connecticut Company's Car for City and Light Suburban Service

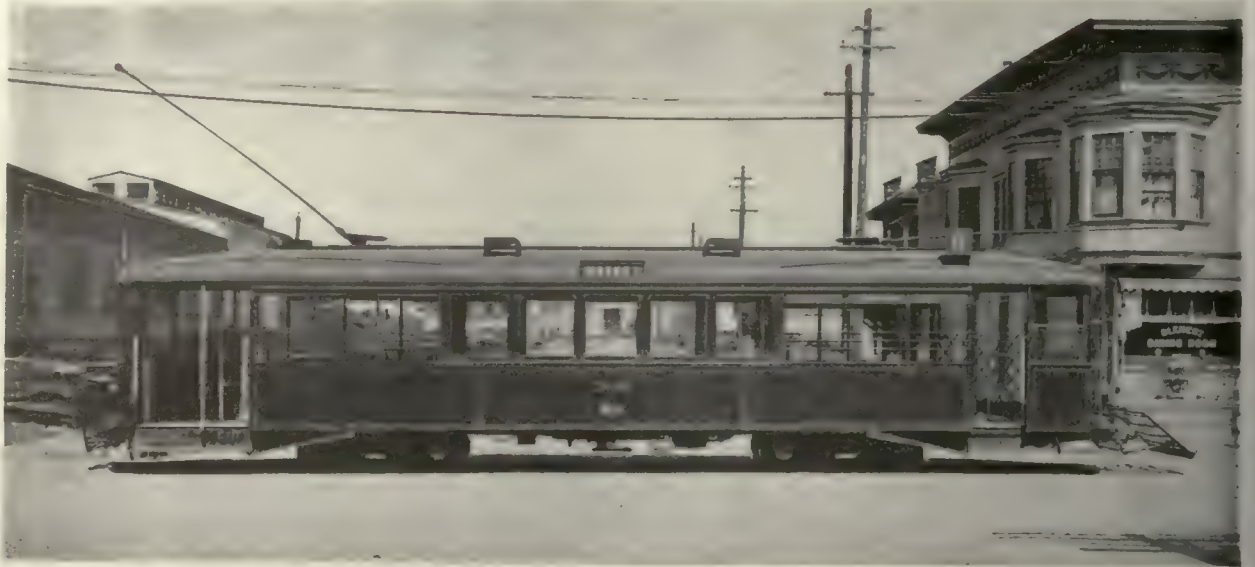
small wheel, and it might be said here in regard to the latter that, within the past few years, there has been displayed, first, a tendency toward the use of the forged steel wheel and, later, a drift back to the use of cast iron. The same sort of a reversal of sentiment, but in a less definite form, appears in connection with the radial-axle truck although the four-wheeled car, in general, is unquestionably growing in popularity at the present time. In recent truck design, also, the built-up type of construction, in which structural shapes are used in preference to forged members, is popular.

In connection with equipment for car-body interiors the final establishment of the prepayment system of fare collection three or four years ago has brought, first, the fare box which is found so very generally on modern city cars, and second, the fully-inclosed vestibule with folding doors and steps that are frequently interlocked with the controller to prevent the car's starting when the doors are open. In addition there is a very evident tendency to devote a constantly increasing share of attention to such detailed improvements as sanitary hand holds, light-weight, non-corrodible fittings, correct-posture seats and the like. Finally, to the equipment for heating, ventilation and lighting there have come the developments that are inevitable with improved understanding of the principles underlying the correct performance of these functions.

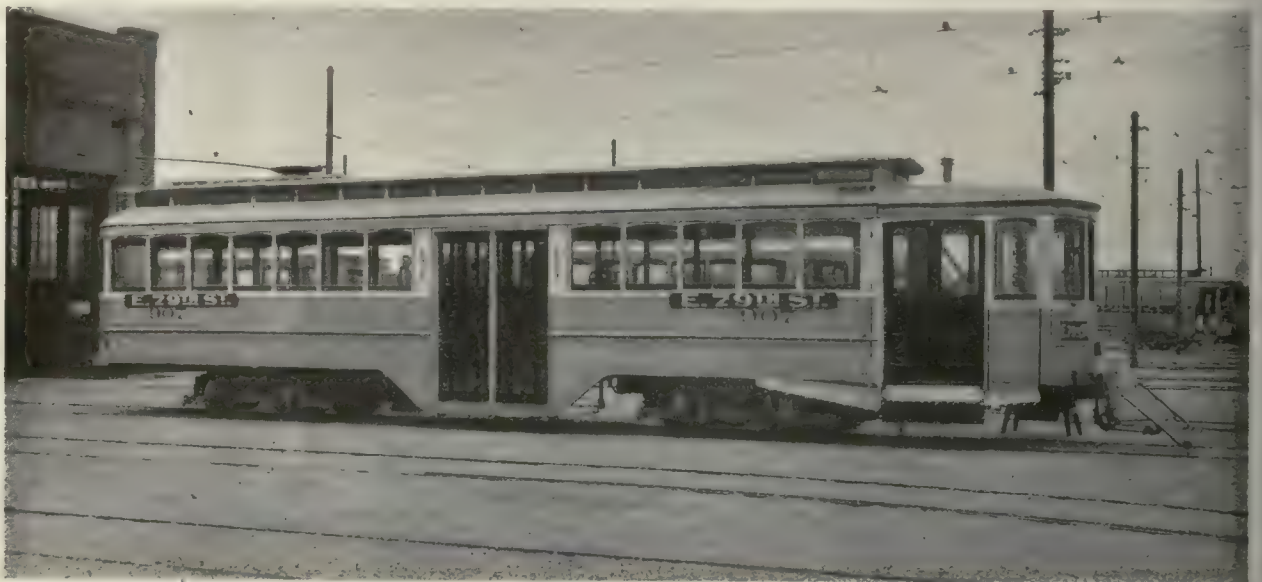
Thus, although the electric heater has changed but little during the last five years, the introduction of thermostatic control has greatly extended its scope, and within the same period the practically universal substitution of the arched roof for the monitor deck has resulted in the design of a number of ventilating devices with an efficiency that even warrants their introduction on old cars in place of the ventilating sash in the monitor whose abolition (for structural reasons) originally brought them into existence. In the same way, car lighting has been revolutionized by the development of the high-efficiency lamp, and practice in this regard seems actually to be approaching a definite standard involving the use of a few large lamps having glass reflectors to diffuse all except the practically vertical rays.

These changes in car equipment have, perhaps, been less spectacular than those involved in recent car-body designs. Nevertheless, taken all together, their influence upon operation cannot fail to be of great importance. Indeed, when they are considered in combination with the changes that have been incorporated in the modern car body, there is warrant for the question whether, without the revolutionary developments of the last five years, it would have been possible for the industry to have survived the constantly rising costs of labor and material throughout the electric railway field.





Modern Development of California-Type Car with Low Floor and Flush Platforms as Adopted in San Francisco



Cleveland Railway's Car Remodeled into Front-Entrance Center-Exit Type



Brooklyn Type of Center-Entrance Car with Ramps and Well



The Car Body From an Operating Standpoint

Recent representative cars have been characterized by the use in city service of small wheels and ramps, reducing floor heights approximately to 30 in. and permitting weights of 15 tons for double-truck city cars. The center door, in its original form for interurban service but modified by combination with a front entrance or exit for city equipment has also become prominent, appearing in about one-third of all latest designs, the remainder having fully-inclosed end vestibules that approach standard dimensions.

CHIEFLY involved in the all-important problem of serving the public to the best advantage is the factor of car-body design from the standpoint of operation, which, in other words, involves the body arrangement irrespective of structural considerations. This necessitates discussion of a number of features, which are susceptible of being classified as floor height, door arrangement and interior arrangement.

Of these, floor height appears to be the most important at the present time, because its development as a problem in car design has been more definite than that of any of the others. It may, in consequence, properly be placed first in order of consideration, although it is only in city service that the low-floor idea has been a feature of paramount interest up to the present time.

REDUCED FLOOR HEIGHTS A FEATURE OF MODERN CITY CARS

The low-floor idea had its real inception in 1910 when a large number of center-entrance trail cars

with wheels only 22 in. in diameter were placed in service in Pittsburgh. This design was developed primarily for the purpose of providing large seating capacity in a unit of relatively small weight, in order to reduce the work of the motors on the car that had to haul it. Thus, the seating capacity was sixty-two and the weight only 22,300 lb. The floor was 30 in. above the rail and was reached by means of an interior step 16 in. above the rail, which was covered by folding doors when the car was in motion, the arrangement being devised to furnish the equivalent, in so far as boarding and alighting facilities were considered, of the vestibule floors of the standard Pittsburgh motor cars. Experience with these trail cars demonstrated their numerous advantages, especially their easy-access features, and soon after they were placed in service it was decided to experiment with one of them in operation as a motor car.

Serious obstacles, however, presented themselves in connection with the provision of electrical equipment. The heavy grades and severe schedules in the

city of Pittsburgh necessitated the application of a considerable amount of power, notwithstanding the light weight of the proposed car, and even with four motors the minimum motor size that was considered feasible was 30-35 hp. Unfortunately no then-existing motor in this capacity, of either the mining, automobile or railway type, could be mounted on axles with 22-in. wheels and yet give sufficient clearance to pass over obstructions on the street, so that although there was some skepticism as to possibilities, both commercial and operative, for a motor of the required dimensions, the development of a new design was undertaken by the Pittsburgh Railways Company.

The new motor was designed absolutely along standard lines except that it was provided with commutating poles, which previously had not been applied to motors of such small capacity as 30-35 hp. Also, the core length was somewhat increased and the diameters of both armature and frame were very materially reduced. This enabled it to be carried upon a 22-in. wheel with $2\frac{1}{2}$ -in. clearance or upon a 24-in. wheel with $3\frac{1}{2}$ -in. clearance. Owing to conditions in Pittsburgh, the latter clearance was considered to be the limit, and when the original "low-floor" car was placed in service in 1912, it was provided with 24-in. wheels.

DEVELOPMENT OF LOW-FLOOR TYPES

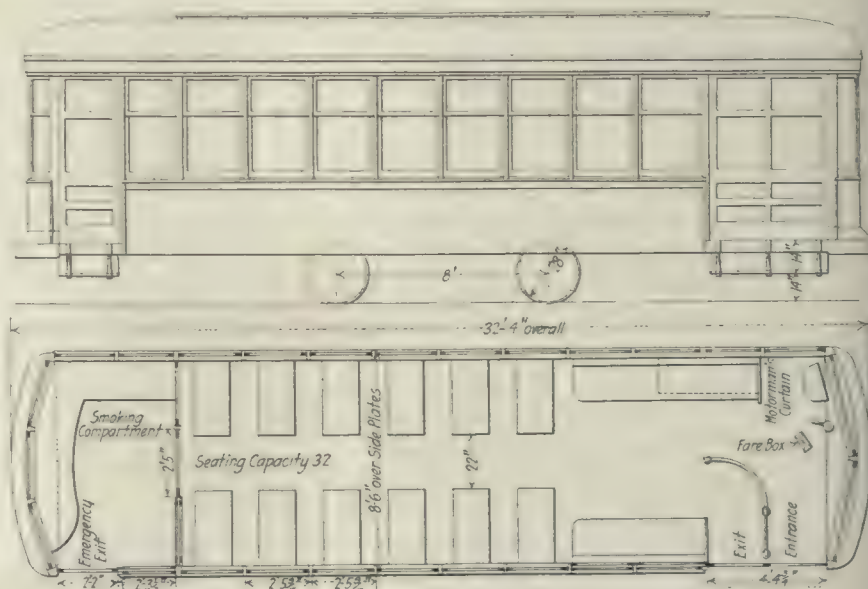
The floor of this original car, it may be said, was made perfectly level and without wells or ramps, except for a small transverse incline from the top of the step to the center line of the floor, and in this respect, it was wholly different from the two other low-floor designs that were placed in service also during 1912. Of the latter types, one was the center-entrance "stepless" car of the New York Railways.

In the stepless design the floor height is reduced by mounting the car body on maximum traction trucks placed with the small wheels headed toward the center of the car. The longitudinal members of the car floor are carried on the low center plate of each truck so that



they just clear the axles of the pony wheels, and the provision for allowing the pony wheels to swing on curves is made by locating them underneath stationary transverse seats placed in such a position in the car body as to provide for a narrow aisle between them. A ramp extends between the entrance space and the ends of the car body, providing for a floor height at the entrance doors of only $10\frac{1}{2}$ in. The motorman is located in an elevated cab that clears the motors and the large wheels of the truck at each end of the car.

The other low-floor car brought out in 1912 was developed by the Brooklyn Rapid Transit Company, and in this design, also, use was made of maximum-traction trucks with the small wheels pointed toward the center of the car, but no radical departure from the customary framing arrangement was introduced. The car floor is level between the bolsters and the ends, while a ramp extends from each bolster to a well at the center of the body, this well serving as a loading and fare-collection space. Only one step is thus required between street level and the well floor, but there is, of course, another step from the well floor up to the main floor.



Single-End, Two-Compartment, One-Man Car for Quincy



A considerable number of both the New York and Brooklyn types of the low-floor car have been placed in service in their respective cities, the Brooklyn design being used also on several other properties, notably the Manhattan & Queens Traction Corporation—a new company that has adopted the design as standard—and also the Manila, P. I. city lines.

With the original Pittsburgh design, however, a short period of trial operation, together with experiments with modified designs, resulted in important changes that consisted in the adoption of a front-exit door in addition to the entrance and exit doors at the center. In this modified form, the type has been perpetuated in large numbers in Pittsburgh, and, of late, in other cities.

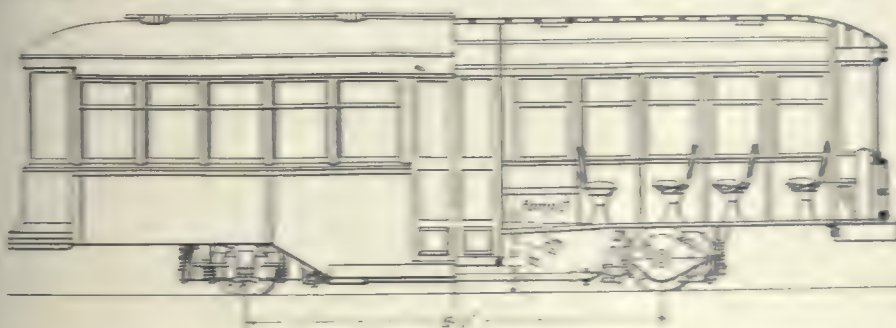
Taken together, these three cars constitute a group of particular importance, because their widely diversified arrangements incorporate every important feature that appears in later modifications of the low-floor idea. However, no other developments of the low-floor principle occurred until the year 1914, when the Cleveland Railway placed in service a lot of center-entrance cars with 26-in.

wheels and a floor height of only 26 in. above the rail. The platform is reached by one step of 12 in. from the pavement, and another step 11 in. high brings the passenger to the level of the car door, at the ends of which are 3-in. ramps. A large number of these cars are in successful use at the present time on the lines of the Third Avenue Railway, of which the Union Railway is a subsidiary property, and the design has served as a forerunner to the several subsequent types in which use is made of the low-floor principle without the center entrance that was so marked a characteristic of the first low-floor cars.

END-DOOR CARS WITH LOW FLOORS

This plan of using a low floor with end doors appeared in a rather striking manner in San Francisco, where the 24-in. wheel was adopted after an elaborate test on an old car in which small wheels and motors had been substituted for 30-in. wheels and old-style motors, the change reducing the weight of the car from 43,140 lb. to 36,920 lb. The operating results, obtained from records of all-day

runs on a line with a number of steep grades, showed a reduction from 3.865 kw.-hr. per car-mile to 3.355 kw.-hr. per car-mile. The resultant saving of 13 per cent in power, together with a reduction of 6 in. in the height of the car floor, promptly brought about the equipment of 123 other old cars in a similar manner. The cost of the new motors and the rebuilding of the track for the small wheels was reported to have been \$1,682 per car, and the return on the investment through the saving in



Glens Falls Center-Entrance Car Equipped with Single-Light Radial Trucks

power alone was estimated to be between 9 per cent and 18 per cent, according to the basis taken for the value of electric energy. Generally speaking, such a weight reduction as in this case, nearly 3 tons, cannot be expected from the use of small wheels with new equipment. About 3000 lb. per car would be more representative. But even this decrease in weight, at 5 cents per pound per year, would save \$150 per annum for each car, so that the present popularity of the small wheel is not surprising.

The introduction of the small wheel in San Francisco led subsequently to the design of a new form of "California-type" car, a time-honored characteristic of Southern Pacific Coast cities. In this new design, which was developed in 1915, the platform floors are flush with those of the car body, the platform being reached by a step 15 in. above the street with a rise of 12 in. to the platform level. There is a ramp from the center of the platform to the king pin of the truck, so that the main floor of the car is about 31½ in. above the rail when the springs are new and the wheels not worn.

The use of flush platforms in connection with a low-floor design appears also in several 1916 cars,

being 13½ in., and the ramp to the bolster 3¾ in., giving a main floor height of 32¼ in.

LOW-FLOOR CARS WITH CENTER DOORS

Although the two last-named cars are of most recent construction, having been placed in service during the spring of the present year, the end-platform arrangement that they possess is by no means a characteristic of all of the latest low-floor designs, since several representative 1916 cars make use of the center door in modified form. Among these are the Des Moines front and center-door car and the Rochester front-entrance center-exit car, both of which, in so far as general arrangement of doors may be considered, are modifications of the Pittsburgh low-floor design. The Des Moines car is almost exactly similar to the Pittsburgh car except that the front door is so designed that it may be used either as an entrance or as an exit, pending a decision based on the results of extended trials to be made in actual service. In this design the steps at the center doors are respectively 14 in. and 12 in. above the rail. There is a transverse ramp of 1 in. between the top of the second step and the center line car and a longitudinal ramp of about 2¼ in. from the central loading space to the bolster, making the height of the floor at the maximum 29¼ in. At the front door the steps are respectively 11½ in., 9¼ in., and 8¾ in. between the rail and the floor level. There is no ramp in the floor from the front door to the bolster, so that this door seems likely to be more effective as an exit than as an entrance.

The latest Rochester car has a similar door arrangement, but it differs from the Des Moines car in that the front door is intended only for an entrance and is no less than 5 ft. 5 in. wide, being provided with a rail along the center line to assist passengers in entering two at a time. The step heights at the front are respectively 13 in. and 12 in. from the rail, and an exterior folding step is provided instead of the interior step used in the Des Moines design. Also, the front platform is dropped 7 in., and a rise of this amount is provided at a step that is placed on a diagonal line at the front of the body. The step at the center of the car is made 14 in. above the rail by installing a well that extends half way across the floor, and there is a transverse ramp of 2 in. in this well between the threshold of the center door and the center line of the car. The step from the well to the car floor is 10½ in., and a longitudinal ramp of 5½ in. leads up to the approximate position of the bolster. The floor height is 32 in. above the rail, notwithstanding the use of 26-in. wheels.

From the foregoing, it becomes evident that the low floor has become exceedingly popular during the past year. Floor heights of approximately 30

TABLE V—FLOOR AND STEP HEIGHTS OF TYPICAL CARS

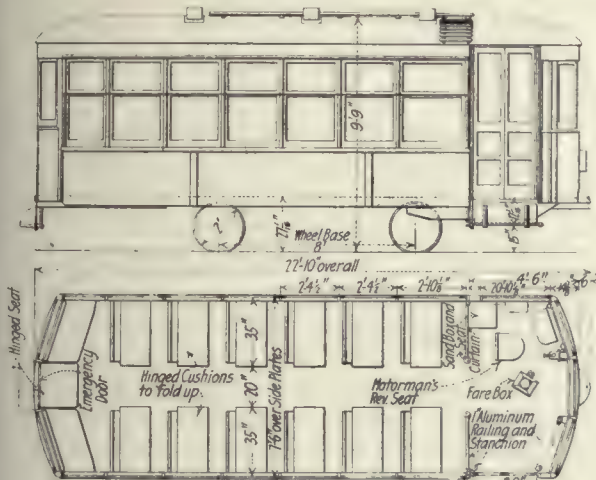
	Floor heights, in.	Wheel diameter, in.	Ramps, trans. and long in.	Center-door step heights, in.	End-door step heights, in.	Remarks
Pittsburgh.....	29½	24	1-5	14-9½	12½-8½-8½	Center-entrance, front-exit.
Union Railway-Single truck....	26	24	3	.....	12-11	Drop platforms.
San Francisco....	31½	24	4½	.....	15-12	Flush platforms.
Buffalo & Erie....	30½	24	1½-2½	.....	13¾-13	Flush platforms.
Wilmington & Philadelphia....	32¼	26	3¾	.....	15-13½	Drop platforms.
Des Moines.....	29½	24	1-2½	14-12	11½-9¼-8¾	Front-entrance, center-exit.
Rochester.....	32	26	2-5½	14-10½	13-12-7	Front-entrance, center-exit.

notably those of the Buffalo & Erie Traction Company. This design in general is similar to that of the latest San Francisco car, the step heights being 13¾ in. and 13 in. respectively. The platform, however, has a transverse ramp of 1⅝ in. on either side of the center line, and there is a ramp of 2½ in. between the platform center line and the bolster. This gives a main floor height of 30½ in. On another recent car of the end-entrance type, that of the Wilmington & Philadelphia Traction Company, the platforms are dropped in the customary manner, so that the car body resembles that of the Union Railway's single-truck, low-floor type. In this case, however, 26-in. wheels are used, and the step from the pavement to the platform level is 15 in. in height, the step to the floor of the body

in. are now so common that the practicability of the principle can be accepted without question. Even with a 30-in. floor height, however, the step heights in all cases may be kept below 14 in. by means of ramps, which, as indicated in the foregoing description, may be introduced either in front of the bolster or in back of it and may easily take up heights of 4 in. or 5 in. The extreme in ramps, it may be said, appears in the 1916 Wilkes-Barre center-entrance car in which a height of 11 in. is taken up by an 11-ft. longitudinal ramp extending from the center well to the bolsters. It is evident, therefore, that the old plan of introducing three high steps between the street level and the car floor has been absolutely eliminated as a feature of modern city-car design.

RAMPS AND WELLS

Comment may well be made here on the various means by which the low-floor principle has been put into effect. These are small wheels, ramps and



wells. As already outlined, the small wheel is the most economical of the three because it introduces important savings in weight, and at the same time it is individually the most logical means for lowering the floor level and therefore has become a fixture in modern car design, generally in combination with one or both of the other two devices.

The ramp also appears with practically every one of the recent representative cars and is probably almost as firmly established as the small wheel, the original objections to it obviously having been founded on prejudice. In fact, a combination of the small wheel and the ramp seems to be inevitable for the modern city car since a significant majority of the latest designs embody both features. The well, however, appears to have lost favor to a marked degree. The major reasons are, no doubt, the lack of clearance for mounting apparatus underneath the well floor, and the introduction of a sudden break in the floor line at a location which is not

very definitely established for the riding public and which may be unsuspected in a crowded car.

ARRANGEMENT OF ENTRANCE AND EXIT DOORS FOR MODERN CARS

Recent developments in the low-floor car are, very naturally, associated with those applying to door arrangement, because for city service the first extended attempt to improve upon the old plan of invariably having doors at the car ends was the center entrance that accompanied all of the pioneer conceptions of the low-floor idea. Nevertheless, the low-floor and center-door principles are quite distinct and should be considered separately, at least in regard to the features peculiar to each one.

On this account it is necessary to mention here, as distinct from the three original low-floor cars, the Washington, D. C., center-entrance car, which was brought out in 1912 but which differed from the Pittsburgh, Brooklyn and New York cars of the same year, in that it could not be classed as mate-



Ultra-Light One-Man Car Designed to Meet Jitney Competition in the Puget Sound Region

rially embodying the low-floor principle. Its design included a straight floor without ramps at the old standard height of 36 in., the wheels being 30 in. in diameter. In the center portion of the body there was a well 10 in. deep, and an outside folding step 13 in. above the rail provided access to the well floor. The design, in consequence, was notable in that it made use only of the center entrance without complicating the issue by combining it with easy-access features. Several practically similar cars were subsequently built in small lots for other cities, but the fact that the design has never achieved extended popularity exemplifies the influence of the major objection to the plain center-entrance cars, namely, congestion at the single center doorway.

To reduce this congestion the Washington car, like the Brooklyn design, has its center doorway divided into three parts, the two outer sections being used for outgoing passengers and the section



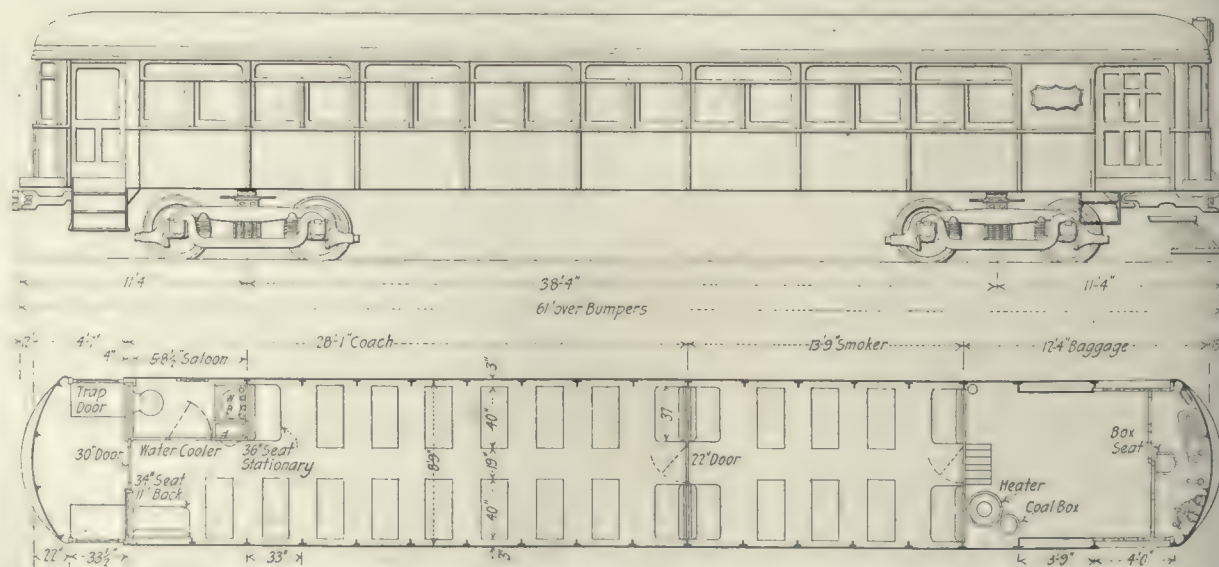
in the center being used only for an entrance. In regard to this feature the Pittsburgh car is quite different, as its center doorway is divided into two parts, each of which is closed by an independently operated door. In the New York design still another arrangement is used, the whole doorway being a clear opening.

The three arrangements are widely opposed in regard to their principle of handling passengers. On the New York car the idea is to have all outgoing passengers leave the car before any prospective passengers start to board it. In the Brooklyn and Washington designs the idea is to have loading and unloading proceed simultaneously, through the establishment of separate lines of incoming and outgoing passengers. In the Pittsburgh design, on the other hand, the basic idea of the arrangement is flexibility of movement, so that the conductor can direct the movement of passengers in and out of the car in accordance with the immediate needs of the situation. The latter radical departure from the usual custom of training the public along rigidly

prescribed lines is said to have been adopted on account of the peculiar conditions existing in Pittsburgh, where it is customary for almost all passengers to be loaded at three or four points within a restricted business district and to be carried for several miles before any unloading takes place, the exact reverse taking place with inbound cars. However, as before mentioned, the Pittsburgh car has a front exit door under the control of a motorman which provides a means for short-distance riders to get off the car at congested loading points without interference from incoming passengers at the center door.

MODIFIED CENTER-DOOR ARRANGEMENTS

This front exit door of the Pittsburgh car was the first modification of the plain center-entrance design to be introduced with a view to reducing congestion at the single center doorway. Subsequently, the same tendency toward congestion at the center entrance was noted in other cities and several modifications other than the Pittsburgh ar-



High-Speed Car for Heavy Interurban Service of Union Traction Company of Indiana

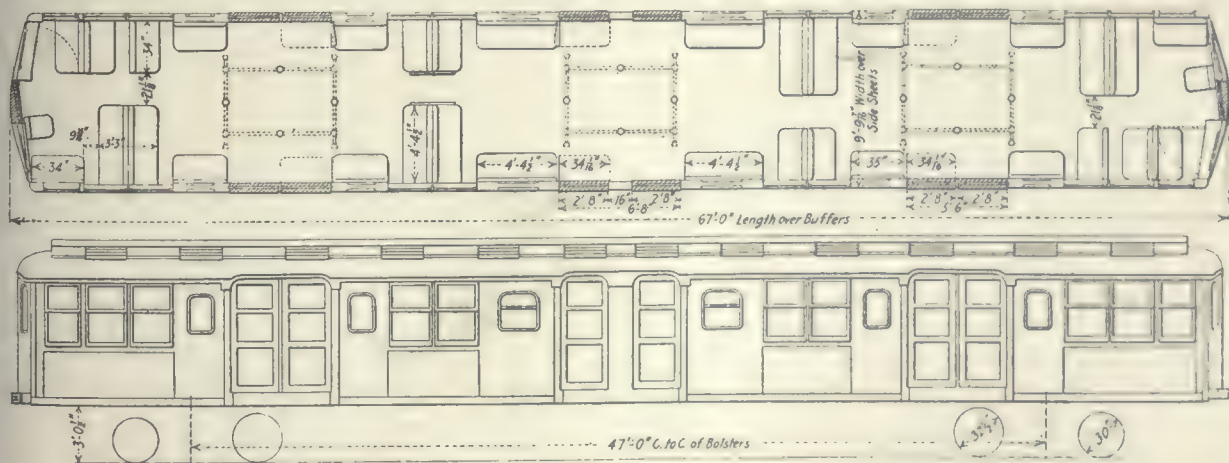


rangement were designed with the idea of eliminating the difficulty. Notable among these was the arrangement provided in several trail cars and in the Cleveland center-entrance cars of 1914, in which the individual entrance and exit doors were separated by a panel 36 in. wide. This provided clearly defined lines for the entering and outgoing passengers even to a greater extent than existed in the Brooklyn and Washington designs; but that it did not eliminate the congestion altogether is exemplified by the fact that during the year 1914 the growth of the plain center-entrance design became almost stationary. At that time, in fact, sentiment appeared to be decidedly against the center door, although admittedly it provided an excellent solution for many of the problems of trail-car design and also for the utilization of old equipment—a subject which may best be discussed in a later paragraph.

Congestion at the center entrance was not the only reason for this situation. Several operators had seriously considered center doors for new rolling stock, but had abandoned the idea because on

some properties the overhead construction was not considered to be in sufficiently perfect condition to permit placing the conductor in the center of the car, where he would be far away from the trolley rope, while on other roads it was felt that the center-entrance car had been found to be not so fast in loading as the old-style rear-entrance car with a front exit. Also, the rear-entrance front-exit car automatically distributed the standing load over the entire car, whereas with a center entrance the standing load was hard to move away from the door, thus decreasing the maximum capacity. Again, in small towns where there are many unpaved streets it was argued that neither the entering nor the alighting passengers had the advantage of using the paved cross-walk when the center-entrance car was used.

These objections, of course, with the exception of the location of the conductor in an inaccessible position as regards the trolley rope, did not apply to the Pittsburgh design, but to this arrangement there was the objection of cross-movements of pas-



Rapid Transit Car with Unit-Type Arrangement of Doors and Seats for New York Municipal Railway

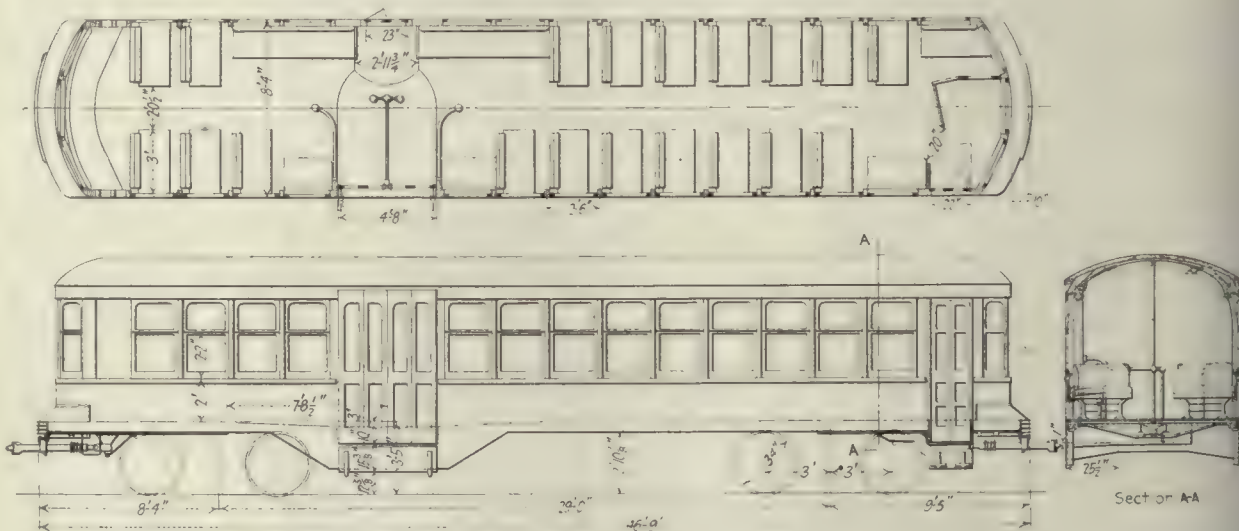
sengers when the center doors were used for an exit by short riders. However, that difficulty was eliminated altogether with the introduction of the modified center-door car brought out in Cleveland early in 1915.

This front-entrance, center-exit design has the same door arrangement as the Pittsburgh car, but the front door, instead of being used for an exit, is used only for an entrance, the center doors being used only as an exit. The conductor is stationed just in front of the center-exit doors, and thus the front half of the car, which has longitudinal seats, is operated on the pay-as-you-leave principle, while the rear half is of the customary pay-as-you-enter type. Cross seats, which are more attractive to passengers, are installed in the rear half. Since all passengers enter at the front and leave at the center, the arrangement automatically distributes the load over the front half of the car, and this entirely elim-

combination of end and center doors introduced in this type of car may have given a new life to the whole center-door principle, although its very recent introduction prohibits any definite conclusions on this point.

POSSIBILITIES FOR THE CENTER DOOR

In general, however, it is evident that the plain center entrance, even with modifications such as a separation of entrance and exit doors, is very evidently lacking in those qualities which will enable it ever to come into general use. As a matter of fact, it now seems obvious that the original plain center-entrance design suffered inevitably from almost exactly the same difficulties as any arrangement in which entrance and exit of passengers are made through a single doorway. Past experience has shown that these difficulties have been sufficient to bring about the general use of the



Birmingham, Ensley & Bessemer Car with Offset Side Doors to Provide Small Separate Section for Colored Passengers

inates the congestion at the entrance. In addition, it provides a prepayment space of extraordinarily large dimensions and enables heavy loads to be put on board in the shortest possible interval of time, while there is afforded almost all of the advantage of the center-entrance car in shortening the movement of passengers within the car body. It should be noted that the arrangement is designed essentially for single-end operation.

A large number of these cars have been placed in service in Cleveland, including fifty old cars that were reconstructed in accordance with this design since the original car was built because of the success of elaborate tests. More recently a number of similar cars have been ordered for other cities, notably in Toledo and in Rochester, where, as before mentioned, fifty of them have been purchased notwithstanding the fact that the local railway company had just previously made elaborate trials of a plain center-entrance design. Indeed, the

front exit in all end-entrance cars, and under average operating conditions they have led to the abandonment of the near-side design in which both entrance and exit are located at the front platform.

The plain center entrance, nevertheless, has the inherent advantage of providing increased seating capacity and of decreasing the structural difficulties and weight involved by having to attach platforms to the framework of the car. Where the problem of rapid loading is not serious, as in the case on interurban and suburban runs, this door arrangement has good reason to be popular, and the percentage of plain center-entrance interurban cars built during the past few years is as large as the total percentage of both plain center-entrance and modified center-door cars that have been built for city service. Increased seating capacity and decreased weight seem to have been the primary reasons for this; but in addition, the center vestibule, or boarding space opposite the center door, pro-



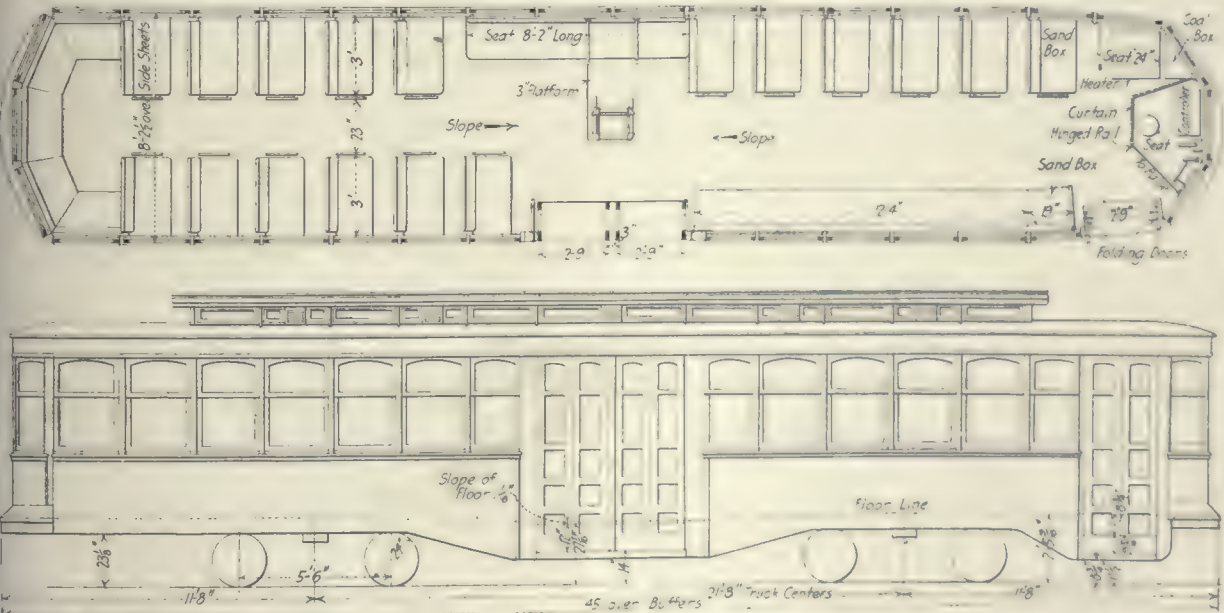
vides a means for automatically separating the main passenger compartment from the smoking compartment, and this feature, as well as the acceleration of passenger movement due to the decreased distances between the door and seats, has been put forward by a number of operators as a reason for favoring the center-entrance over the end-door arrangement for interurban service.

In general, the variations that have been made in the design of center-entrance interurban cars are minor in character, and this fact, together with the very wide distribution of center-entrance cars among the different interurban railways rather than the purchase of a large number of cars for a very few properties, leads to the belief that in interurban service the center entrance will undoubtedly be perpetuated. Note should be made here of the off-set door arrangement whereby the interior vestibule may be made to separate compartments of different size. This plan, of course, is applicable only to single-end cars; but that it may be successfully utilized is evidenced by the Birmingham, Ensley & Bessemer car, in which the vestibule is well located to the rear of the outer line, being used to separate a small compartment for colored passen-

gers from the large compartment at the forward end of the car body.

With new single-truck cars of reduced capacity, the center door has made very little headway, although the operating difficulties of the center entrance are obviously less with a small car than with a large one. The center entrance has, however, been very largely adopted for trail cars because of its previously mentioned advantages of large seating capacity and reduced weight. In addition, it has appeared as a means for modernizing old cars that may be considered too small for regular service and too much inclined to "pitch" on account of a short wheelbase. Generally speaking, the method by which such reconstructions are carried out is to splice two old car bodies together after removing the platforms, using drop sills of steel to span the interior vestibule or well that is left between them, and constructing a rigid steel doorway coupled at the top to the letterboards to provide strength for the structure as a whole. The stresses at the center section may obviously be minimized by balancing each half of the rebuilt structure over its truck.

A number of such reconstructions have been undertaken since the first center-entrance cars were



Des Moines Front-and-Center-Door Car



placed in service and the cost in general has been low. In Pittsburgh, for example, the expenditure for splicing two 20-ft. car bodies so as to make a 48-ft. car with a center well and an interior step was found to be \$400. In addition a number of open cars, condemned on account of the practical obsolescence of that type, have been made over into center-entrance cars having various combinations of exterior and interior steps and wells to provide access to the car body. On the Pacific Coast, also, many California-type cars have been reconstructed, notably in Los Angeles, where center entrances with ramps and outside steps were provided in the reconstruction of some 300 of the railway company's narrow-gage cars at a reported cost of \$678 per car.

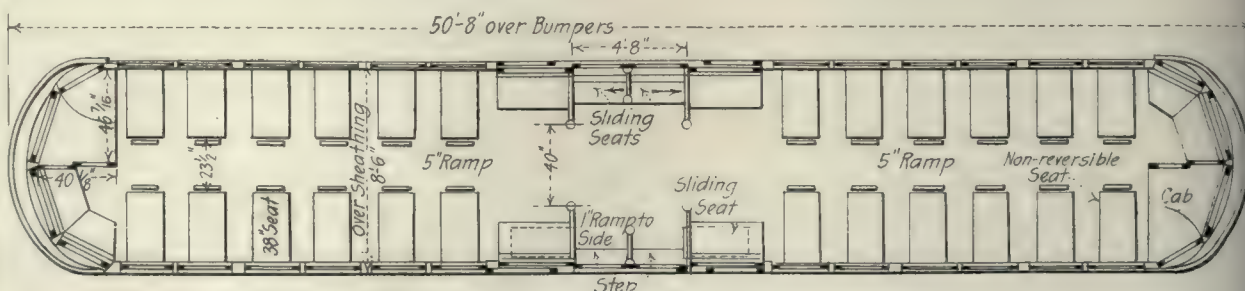
The ultimate value of such rebuilt cars is, of course, problematical, in view of the change of opinion that has taken place regarding the plain center-entrance design. However, the Boston articulated type of car, made up from two old car bodies with a specially constructed center section hanging between them, has appeared in a number of cities, and it offers advantages in the utilization of old equipment that are not possessed by plans for reconstruction having no special provision for easy access to the car body. A feature worthy of note in the design of the center section is that housings are provided in the roof for the trolley ropes from the old car bodies at either end of the unit, and, in consequence, the conductor is able to replace a trolley pole that has jumped the wire, or change poles when the direction of operation is changed, without going outside of the car. The cost is estimated to be

approximately \$1,000, and the added weight has been found in one case to be only 1000 lb. over the original weight of the two small car bodies, the reason being that with the introduction of the center section there are eliminated two platforms and two sets of controllers, together with other miscellaneous equipment. The most obvious difficulties are the extremely large seating capacity and the complication of the passenger's movements within the center vestibule.

ARRANGEMENT OF MAJOR FACILITIES WITHIN THE CAR BODY AND VESTIBULES

The kaleidoscopic changes presented by these recent developments in center-door designs have, naturally, obscured somewhat the importance of the end-platform arrangement for car bodies. Nevertheless, in new construction the end platform is still more prominent than the center door, from a numerical standpoint, and it possesses the great advantage of having most of its history behind it. Between the two types of design the main point of difference is really one of passenger movements, because when broad generalizations are made many common features of interior arrangement appear, and these may be discussed at the same time. As a matter of fact, one of the most important recent developments in the design of end-platform cars, namely, the inclosure of vestibules, can be ascribed largely to the results of experience with the early center-entrance cars.

Provision for the complete inclosure of the car while in motion became unquestionably the most prominent feature of surface-car design during



Typical Center-Entrance Suburban Equipment of Washington & Virginia Railway



1914, and the record of its installation since then shows an overwhelming majority in its favor. Not only have vestibule doors been applied generally to new equipment, but in many instances they have been applied to old cars also. Indeed, at the present time it has become almost as unusual for a city car to be without the fully-inclosed feature as it is to have the prepayment facilities omitted. The reason is that boarding and alighting accidents are thus practically eliminated, while on new cars, at least, the cost of the installation is insignificant. Even on old cars the application of folding doors and steps, together with an interlocking device to prevent starting the car when the doors are open, has been found in two large cities to pay for the change within about two years through the reduction in damage claims.

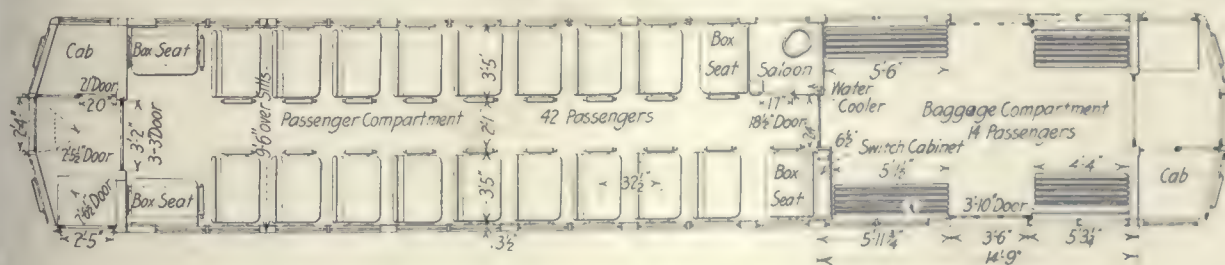
Of course, it is no new idea to have cars completely inclosed, thus preventing ingress and egress of passengers while the car is in motion. Several lines have used this feature in modified form for many years. But the scheme, until recently, met with scant favor throughout the country at large because of a widespread belief that it would involve a material decrease in schedule speed, and it is probable that a complete change in sentiment, such as has taken place within the past three years, could have been effected only through the successful introduction of the center-entrance car, which is of necessity completely inclosed. Including city cars of all descriptions, the use of folding doors and steps for the vestibule appears to be almost invariable, regardless of the type, extending from

the smallest one-man car to the largest standard unit for metropolitan service.

VESTIBULE DOORS

Generally speaking, the existing types of doors for fully inclosing vestibules may be divided into the three classes of folding, sliding and "non-sweep." The former type is, at the present time, much more prominent numerically than either of the others, presumably on account of its simplicity and limited space requirements. The sliding door has been utilized most generally with rapid-transit cars, but has been used also with some of the earlier plain center-entrance cars. Its obvious advantage is the elimination of need for provision of transverse clearance for the door movement, but opposed to this is the necessity for a longitudinal pocket into which the door can slide, and where the doorway is extremely large the weight and length of movement of the door may become objectionable. With the non-sweep type of door it is aimed to attain the advantages of both of the foregoing types without their space restrictions. The operation is such that the door slides around the inside of the corner that exists between the plane of the doorway and the side of the passageway leading to it, and the movement may be obtained quite easily by the use of a pair of straight guides for both the top and the bottom of the door.

In addition to the several types of vestibule door, there are available for vestibule inclosure a number of alternatives in the use of apparatus, such as folding or stationary steps, location of the door at



Three-Compartment Interurban Car for Wilkes-Barre & Hazleton Railway

the vestibule threshold or at the edge of the step below it, and outwardly folding doors as opposed to those that fold inward. The most obviously popular combination, however, consists in the location of an outwardly folding door at the vestibule threshold with a mutually operated folding step below it. This arrangement, of course, involves the use of a step mechanism, which has been eliminated in some designs either by locating the door at the edge of the step or by locating it at the vestibule threshold and allowing the stationary step to be exposed while the car is in motion. Objections to both of these alternatives exist because of the gap that must be left in the vestibule floor between the threshold and the door in case the former is accepted, and because of the possibility of exterior accidents in case the latter alternative is chosen. The complication of the folding-step mechanism, therefore, has warrant for its existence and this appears to be borne out by the majority of designs

open position. The very wide doors that appear in the records of recent construction are manifestly the result of adopting the pay-as-you-enter rather than the pay-within method of fare collection, and the pay-within system appears at the present time to be more popular than the former. The average door width of 48 in. bears out the common understanding that it is practically impossible to get passengers to pass in double file through a doorway which is narrower than this, and even then guide railings, or at least stanchions, are considered necessary as a rule.

The influence of the pay-within car is reflected in the lengths of vestibules for recent cars, for which the dimension of 5 ft. 6 in. measured from bulkhead to dash appears very much more frequently than any other, no less than ten out of fifteen recent designs having a vestibule length of either 5 ft. 6 in. or 5 ft. 7 in. A few modern cars have been equipped with vestibules as long as 7 ft., but since these are



Long-Platform Pay-As-You-Enter Type of Car Recently Built for Kansas City Railways

that make use of it. Inwardly folding doors, as compared with those that fold outward, have the advantage of not affecting exterior clearance for the car body, but this is offset by the fact that the door movement may be interfered with by passengers who are standing in the vestibule prepared to leave the car. With the non-sweep door, which, of course, cannot be made to open outward, this difficulty is altogether eliminated, because the inward movement takes place only along the walls of the vestibule, the half-doors moving apart when being opened much as if they were of the sliding type. In Pittsburgh, where the non-sweep type of door is widely used on account of narrow streets and restricted exterior clearances, no trouble appears to have arisen because of the inward door movement.

DOOR OPENINGS AND PASSAGEWAYS

Widths for vestibule door openings display a great variety. For recent representative cars a dimension of 36 in. appears to be about the minimum, and this ranges upward to a maximum of 68 in. There is a fairly well-defined majority in the vicinity of 48 in., the dimension being measured as the net clear space between doors when they are in the

the exception rather than the rule there is a reasonably good indication that the movement toward shorter prepayment-car platforms, which began some ten years ago, will soon produce a standard dimension. In regard to vestibules that are shorter than the common figure of 5 ft. 6 in. it may be said that these also are exceptionally few for recent cars of the standard double-truck type. On single-truck cars, of course, vestibule lengths are much less, ranging downward to an apparent minimum of 4 ft., this dimension applying to one of the latest ultra-light one-man cars. A dimension of 4 ft. 6 in., however, is a much more popular length for vestibules of small cars, and from the small difference between this figure and the customary vestibule length, it would seem that there is not much likelihood of large city cars having their vestibules reduced from the present practical standard length of 5 ft. 6 in., especially when the shorter vestibule practically compels the use of a door that is too narrow for a double file of passengers.

It might be noted here that exits at front platforms appear in recent cars as narrow as 23½ in. although clear openings somewhat larger than this, or between 27 in. and 30 in., are generally preferred.



Lengths and Widths for Modern Car Bodies

Experience has shown the most economical carbody length to be 45 ft. for double-truck city cars. The controlling factor, where stops are indeterminate, is schedule speed rather than clearance dimensions, which are dominant solely in high-speed service, but a number of single-truck cars which approximate only 33 ft. in length owing to mechanical considerations have been recently built. Widths for most recent city cars are surprisingly uniform and might even be standardized at 8 ft. 4 in. without difficulty.

THE subject of car-body capacity, or size, offers a problem of considerable complexity and material importance in connection with car design from an operating standpoint, but since it is really basic in character its discussion in a separate chapter is warranted. Generally speaking, the tendencies displayed by the most recent designs indicate that, at least for some time to come, there will be little likelihood of any appreciable change from the general dimensions that have been shown to be best by the accumulated experience of the industry.

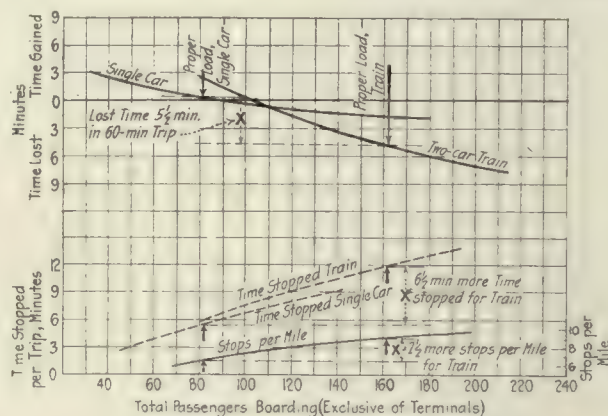
Numerically, an overwhelming preponderance of recent cars for reasonably large cities are of a length approximating 45 ft., measured over the bumpers, although occasionally a design is encountered with a length as low as 40 ft. or as

high as 50 ft. In the case of cars for the smaller communities there is less tendency toward an agreement on length, but even so, a very large majority exists in favor of the range between 30 ft. and 35 ft. Practically all of the smaller cars are of the single-truck type, and in consequence, they constitute a fairly distinct class by themselves. Since the jitney bus development ran its course, however, still another class of city car has appeared, this being less than 30 ft. long and of extremely light weight, so that city cars in general may be divided into three classes—double-truck, single-truck, and ultra-light. In the same way, interurban cars range between 55 ft. and 60 ft. in length, and cars for heavy electric traction seem to be fairly well standardized between the lengths of 65 and 70 ft., which are set by clearance limitations.

Seating capacities for cars of these several lengths are naturally subject to wide variations, depending upon the interior arrangement, upon the use of platform seats in city service and the installation of baggage compartments in interurban service, as well as upon the possibility of single-end operation. In any event the total capacity, including standing passengers, is better measured by length than by the number of seats, and in consequence the length will here be considered as the unit of capacity.

INFLUENCE OF EXCESSIVE CAPACITY IN CITY SERVICE

In ordinary city service to-day the factors of schedule speed and headway exert a dominating influence on car-body size, and the problem of limitation of physical dimensions because of narrow streets, sharp curves and the like, has become of only secondary importance, except in rare instances. This is indicated by the practical standardization



Operating Results of Test on Two-Car Train Compared with Single Car

of city car-body widths between 8 ft. 4 in. and 8 ft. 6 in., measured over the belt rails. Of the two factors of schedule speed and headway, the former appears to be considerably the more important, although its influence is indirect and, to a certain extent, obscure. Its action is that, as car capacity increases, stops will be longer and will be made more frequently because more passengers will board and alight, and this involves lost time. In other words, a car that holds few passengers will make better time over a run requiring an indeterminate number of stops than a car of large capacity. In practice this has been demonstrated by the inability of the double-deck car, with a capacity of eighty or ninety seats, to maintain schedules, resulting in its failure to be perpetuated after experiments in Pittsburgh, New York City and Washington, D. C., three years ago.

Generally speaking, the two-car train also is an example of extremely large car-body capacity since two cars thus coupled together really make a single

unit of double normal size, and the accompanying graphic results of a representative test on a two-car train show this effect clearly. Unfortunately, in any such test the influence of the increased capacity can be expressed only in limiting figures, and the time lost by the two-car train in this case is between the limits of 9 per cent as a minimum and 16 per cent as a maximum. The former figure is derived from the curves at the upper part of the graph which show that a single car, when carrying the proper total number of passengers throughout the run in question to give a proper maximum load, made just about schedule time, while the two-car train, when carrying twice this load, lost five and a half minutes in a sixty-minute trip, or 9 per cent.

These curves were plotted directly from the test observations, but even direct observations are affected by the personal element of the platform men, who will always make an extra effort to move faster when they get behind time. To eliminate this disturbing factor the lower part of the graph was plotted to show the observed "time stopped" as well as the stops per mile by both train and single car during each of a number of trips. From these data the following deductions may be made: Since the trip in question was 9 miles long an assumption of nine seconds lost in acceleration and braking for each stop would give a loss of eighty-one seconds, or 1.35 minutes per trip, for each increase of one stop per mile, and since the properly-loaded train made $2\frac{1}{2}$ stops per mile more than a properly loaded single car the loss from this source must be three and a half minutes. Also, the two-car train was actually stationary for six and a half minutes more time during each trip than the single car because it had to handle double the number of passengers, and the sum of the two losses, or ten minutes per trip, amounts to 16 per cent of the schedule time.

This latter result, however, does not take into consideration the effect of vehicular interference, which is less obstructive when two-car trains are used because of the smaller number of units on the street, and, in consequence, some of the 16 per cent of time lost at the stops by the train would be made up by it through faster running between stops. But as this is an indeterminable factor, the actual slowing down of the schedule on the run in question can only be expressed as less than 16 per cent, although the direct observations showed the loss to be more than 9 per cent. This is sufficient, however, to make the two-car train a losing proposition through the increase in operating expense that comes with slower speed.

It should be noted here, perhaps, that the above figures apply only to one particular line. On other



runs the loss might be greater, or it might be materially less, even to the point of making the trail car profitable. Such conditions would be those approaching the case, where, for example, practically all of the load is taken on and put off at a few important transfer points. The increase in capacity of the train would then be less of a handicap, because it would probably make but few more stops throughout the trip than the single car. The skip stop produces a very similar effect, and its introduction has been found frequently to offset the time lost by the use of two-car trains.

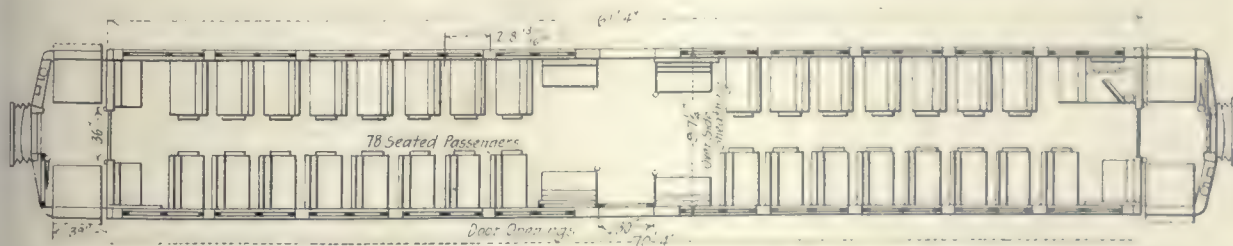
From the foregoing, it is evident that there is a maximum size for cars which cannot be profitably exceeded. The double-deck car and the two-car train clearly exceed this maximum, and their failure to be perpetuated show at least that a seating capacity of, say, eighty, and a correspondingly large total capacity is, under normal conditions, very much too high. There are, unfortunately, no data available for determining just how much too large the double-deck car may be. However, a good line on the situation may be drawn from the influence of past experience, and this, as previously mentioned, sets the length of cars for large cities within 5 per cent of 45 ft. During 1915, for example, an analysis of car orders, representing 80 per cent of the total cars purchased, showed that two-thirds of the new cars were within these limits. A total of 133 cars were ordered with a length exceeding 47 ft. 6 in., but of these, three were

sample cars and the remaining 130 were purchased for the city of Cleveland, where the existence of the skip-stop method of operation permits larger cars than could be used under ordinary conditions.

For service in large cities, therefore, the maximum permissible car-body size appears to be but little, if any, in excess of 45 ft., and except under special conditions city cars that are longer are very likely to be of too large a capacity. Even the jitney bus craze of 1915 worked as a demonstration of this fact, and one of its results has been a more or less well-defined swing to the opposite extreme, or to the ultra-small car. Nevertheless, a car may be too small just as definitely as it may be too large.

EFFECT OF REDUCED CAPACITY

Unfortunately, the ultra-small car has come to be called the one-man car, and this rather confuses the issue of car-body capacity that is involved. In general, the one-man car should be considered as distinct from the ultra-light design (which includes but a small fraction of the total number of equipments built especially for use in small cities) because the use or non-use of one-man operation is purely an operating consideration. Indeed, the possibility of operation with one man is, apparently, almost independent of car-body capacity, since cars 42 ft. in length and with seats for forty-seven passengers have been operated successfully without a conductor. Consequently, the one-man car, as such, will be considered here only in con-

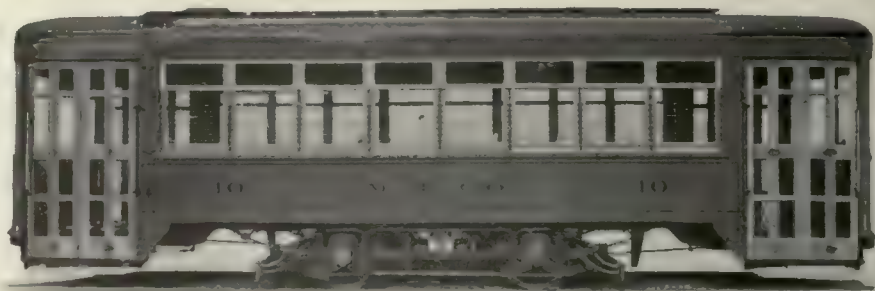


New York, Westchester & Boston Railway's Equipment for Heavy High-Speed Service

nection with the equipment that is peculiar to it, and no attempt will be made to compare one-man and two-man operation or to generalize regarding the effect of one-man operation on economy through the reduction of platform expense accompanying it.

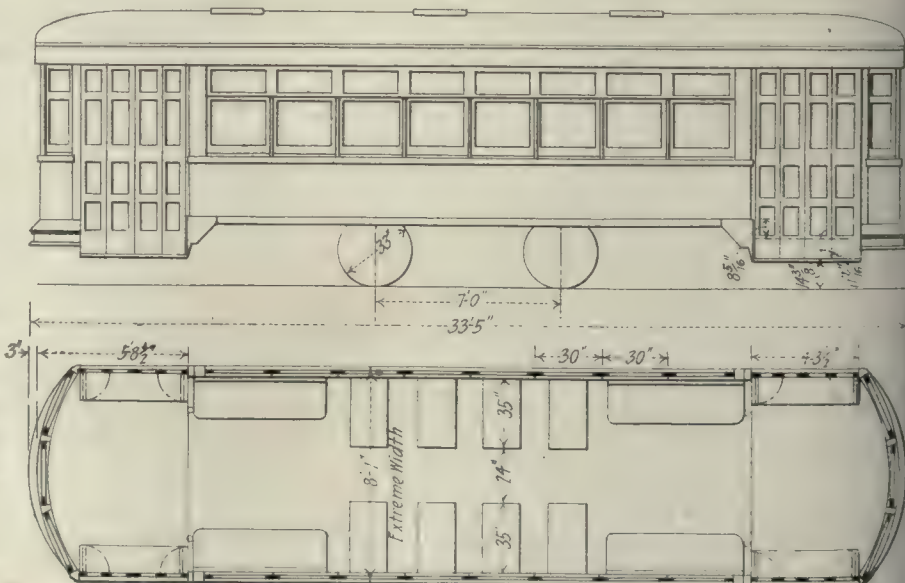
The item of platform expense in general, however, is a dominating factor in establishing a minimum car size. Thus, while it has been previously shown that a small unit can make faster schedule speed than a very large one, and hence can reduce operating expenses, it is nevertheless inadvisable to have units that are too small because of the resultant excessive cost of platform labor per passenger. For example, if it is assumed that the substitution of a 35-ft. car seating thirty-seven passengers, for a 45-ft. car, seating fifty, increases the speed on a certain run by, say, 5 per cent, the original operating expense would be reduced by some 3 cents in each dollar. But the platform expense, which might well be 35 cents out of every dollar expended in operation, would be increased by one-third, or say 11 cents, because one-third more platform men would be required to handle a given number of passengers. The saving of 3 cents on the dollar due to higher speed would, therefore, be more than offset by the 11-cent loss from greater platform cost, leaving a net deficit of 8 cents on the dollar of operating expense from the substitution of the small cars. Thus appears the general rule that, within reason, the largest car is the most economical one that can be used.

Here, however, the factor of headway enters into the problem. Obviously, a point is reached in every community where an increase in the intervals between cars results in a serious loss in gross receipts. Short-haul passengers, who are the only ones carried at a profit for a 5-cent fare, will not ride if the headways are as long as twenty or thirty minutes, and therefore it often becomes advisable to give a frequent service even if the cars are not filled, the actual frequency depending,



of course, upon the circumstances that apply to each particular community.

Under such conditions—leaving out of consideration the question of one-man versus two-man operation—the matter of platform expense ceases to be a factor, because a certain number of cars must be run during each hour and each car will have two platform men (or one if permitted by the circumstances applying to the particular community). The problem of car capacity then becomes one of expense for maintenance and power, considered in connection with rush-hour conditions. If there were no peak the car-body capacity would, of course, be directly determined from the number of passengers normally requiring transportation under the conditions of headway found locally to be most desirable, with an allowance for future growth of the community. However, a peak is practically inevitable in city service, and consequently it becomes conceivable that the extra weight of a large car body may profitably be hauled through the non-peak hours merely to save the cost of trippers during the rush, thus following the previously-mentioned general rule regarding the economy that may be expected from the use of the large car body.



Standard Type Single-Truck Car for Marshall, Tex.



of a tripper. Hence, the saving by the use of the large car instead of the small one would be \$3 per day, while the loss due to the extra maintenance and the power consumed by hauling the added weight during the non-peak hours would be only \$1.53. The net

If, for example, the weights of the two previously-mentioned fifty-passenger and thirty-seven-passenger cars are assumed to be respectively 33,000 lb. and 24,000 lb., the cost of hauling the additional weight of the large car during the fourteen non-peak hours will be 32 cents per day for power, this being based on 110 miles run, 130 watt-hours per ton-mile, and an off-peak energy cost of $\frac{1}{2}$ cent per kilowatt-hour. Maintenance and miscellaneous expense at 4.4 cents per car-mile in the case of the large car would mean an increase of 1.1 cents on this score also, or for 110 miles, an increased cost of \$1.21 per day, which, added to the power cost, would total \$1.53.

However, during the peak the large car's 35 per cent greater capacity will permit it to save the expense of, say, one-third of a tripper car. Tripper-car operating expense naturally will be much higher than the normal car-mile cost and may be assumed at 30 cents per car-mile. Then, during a four-hour peak, the tripper would run, say, 30 miles and would cost \$9 daily. One-third of this sum, or \$3, would be saved by each large car in normal service, since the increased size would be equivalent to one-third

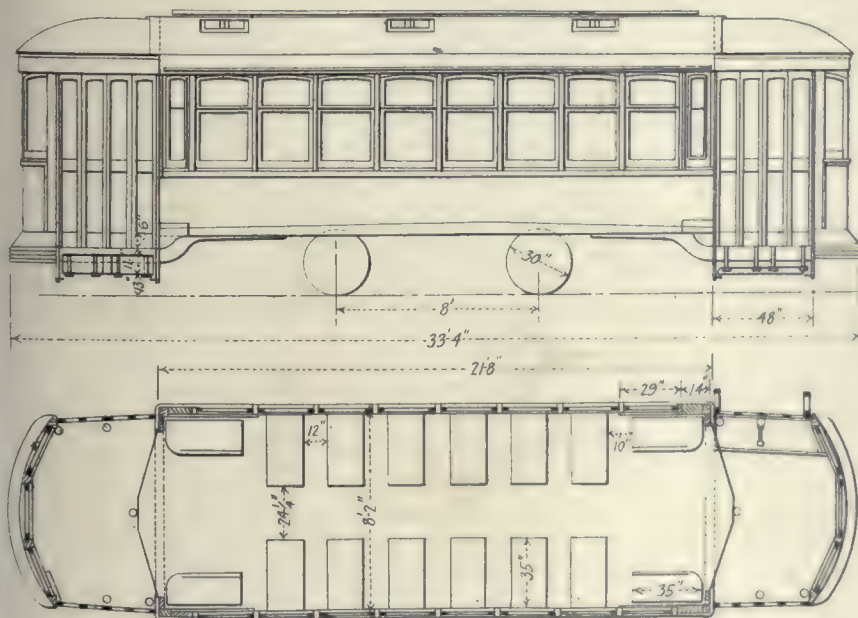
saving for the large car would then be \$1.47, and, under the conditions cited, it would pay to use the big units even though they would normally be only three-quarters full during almost the whole day. It might be noted here that no allowance for interest charges have been made in the above figures, the reason being that the increased cost of the large cars would be roughly offset by the cost of the tripper cars required in case the small cars were used.

Such conditions as these seem to be the rule rather than the exception, judging from the record of recent construction, so that here again is support for the general rule that it pays to use large cars within the limits set by past experience.

INFLUENCE OF THE SINGLE TRUCK

It might well be remarked here, however, that the factor of headway becomes increasingly important as the population of the locality that is served becomes less, and hence the advantages of the large car body has a decreasing value. When extreme conditions obtain, the single truck becomes a feature of decided importance, because its economies may be sufficient to turn the scale against the use of a large car body, and thus warrant the use of a smaller body that can be mounted on four wheels.

Assuming good track, there appears to be no question that the single-truck car (within its physical limitations) would be invariably preferred to the double-truck design. The reasons begin with reduced first cost, which has been found in the case of some single-truck cars to be as low as two-thirds of the cost of small double-truck designs of equal seating capacity. In the second place the weight is less,



Recently Constructed Single-Track Car for Albany

the difference in favor of a single truck for a design approximately 35 ft. in over-all length being of the order of 3 tons. Finally, there is a reduction in maintenance cost because there are fewer wheels and axles to maintain as well as only about half the number of truck parts, brakeshoes, journal bearings, trolley bases and the like.

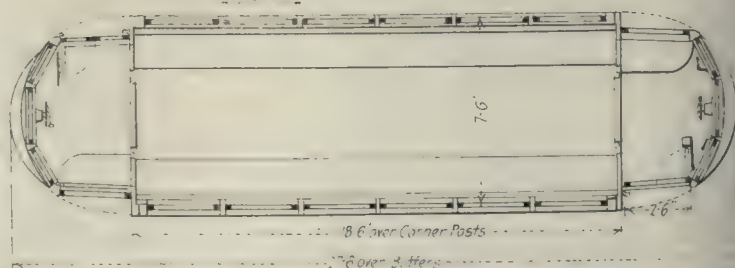
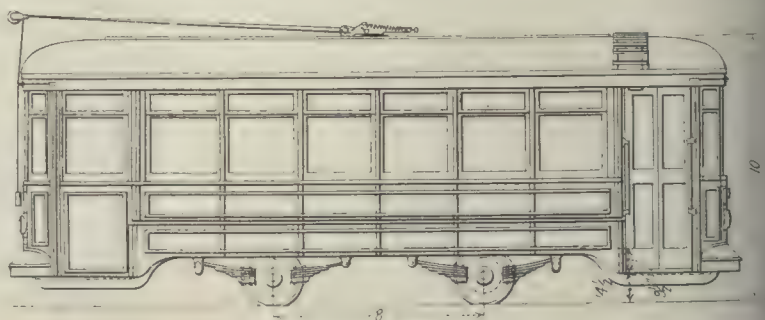
The absolute maximum of car-body length that appears to be permissible with a single truck is 35 ft. and most of the recent single-truck cars are even slightly shorter than this. Therefore, when circumstances favor the use of a car that is appreciably less than 45 ft. long it is obviously desirable to skip intermediate sizes and go to a body length of 35 ft., thus permitting the use of a single truck. Here, of course, the general rule of using the largest body is upset, in the main, but the rule's influence appears, nevertheless, in the obvious existence of a marked tendency to use, with single-truck cars, the largest body that can be mounted on a single truck. The tendency is demonstrated by an analysis of the motor-car orders for city service in 1915. This shows that while there were twenty-one lots of standard cars with a length approximating 45 ft., only four lots were ordered with lengths between 35 ft. and 40 ft. No less than nineteen orders, however, were placed for cars between 30 ft. and 35 ft. in length, while, notwithstanding the sudden popularity of the ultra-small car designed solely for one-man operation, only ten orders were placed for small lots of cars less than 30 ft. long.

Although the maximum length for single-truck cars has been stated to be 35 ft. measured over bumpers, it should be noted that this length is attained only by use of a non-parallel-axle truck and that the single-truck cars with rigid axles do not appreciably exceed 33 ft. in over-all length. The reason is, obviously, excessive overhang of the car ends because of the relatively short wheel-base which is required with rigid-axle trucks, and which tends not only to make the car pitch or "gallop," especially on bad track, but to require excessive clearance on curves as well. Of course, the non-parallel-axle truck eliminates most of these difficulties, but in case it is used there is lost much of the advantage of simple construction that charac-



terizes the plain single-truck designs, and as a consequence, opinion is divided on the merits of the two types. A majority of the most recent single-truck car orders, as a matter of fact, have rigid-axle trucks, so that the tendency, if anything, appears to be to adhere to the older and simpler design.

Note should be made, however, of the record of the non-parallel-axle truck used in connection with the previously mentioned low-floor car of the Union Railway. A large number of these cars have been in service since October, 1914, and all of them are operating in a very satisfactory manner. The schedule speed ranges from 9 m.p.h. to 11 m.p.h., and the maximum speed ranges from 20 m.p.h. to 22 m.p.h., most of the cars having been worked on outlying semi-suburban lines where the track conditions are, to say the least, rather poor. At the time when the cars were placed in service a question arose regarding the possibility of excessive flange wear, but it has been found from experience that the flange wear is nearly normal and that rolled-steel wheels will run about 40,000 miles between turnings.



Tucson Truckless One-Man Car with Automobile Motor Drive



In connection with single-truck cars brief comment perhaps should be made in regard to door arrangement, because practically all of the cars are of the end-platform design. However, a center-entrance design has been purchased for Bangor, Me., and another for Hampton, Va. Both of these cars have single-axle radial trucks, and they have low floors like the Union Railway single-truck design. Otherwise recent single-truck designs display rather marked conservatism—a somewhat surprising condition because seating capacity, which is the glaringly weak feature of the single-truck car, may be greatly increased by adopting a center entrance, although it should be noted that the Union Railway design approximates the same effect by providing large platform seats.

THE ULTRA-LIGHT CAR

The ultra-light car is the most recent development of the single-truck type, although, as has been previously pointed out, it constitutes an entirely distinct tendency in design and contains no immediate prospect of directly displacing the larger unit. The reasons for and against its existence, which probably have been somewhat exaggerated in importance by the brief but costly activities of the jitney bus, are precisely those that apply to the single-truck car in comparison to the standard double-truck design. The ultra-light car saves in first cost, power, and maintenance over the single-truck car of normal design, but is handicapped by greater platform expense per passenger.

As has been pointed out before there is nothing to prevent any car from being operated by one man, so that the large single-truck designs have the ad-

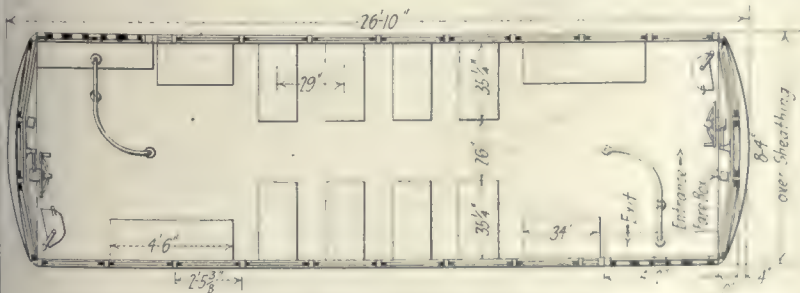
vantage of being operable as either one-man or two-men cars in accordance with the circumstances applying to any particular locality. In fact, it is the practice in several communities to operate single-truck cars, or the equivalent, with one man during the light hours and with two men during the rush, or to operate with one man in outlying

districts and with two men in congested zones by having conductors board the cars when they reach the business section of the town.

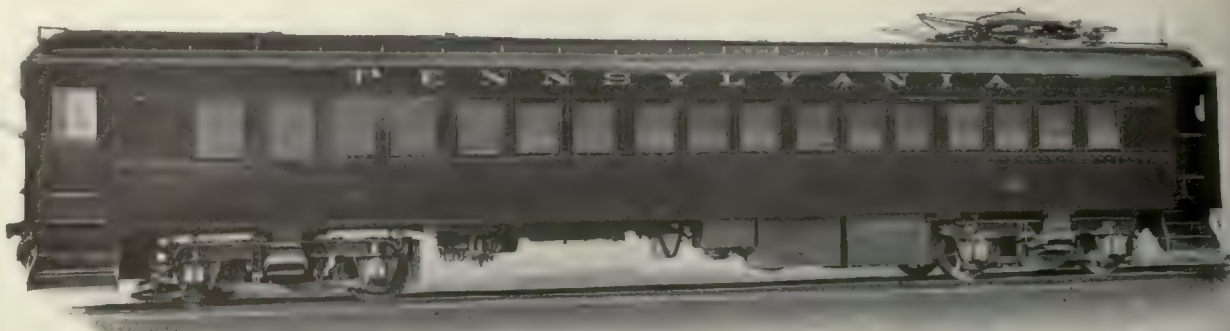
With the ultra-light car, however, such combined operation is not very readily permitted, primarily because of the car's compact construction, but also because of its small capacity. Its comparison with the large-size single-truck cars operated by one man is no more than the problem of proper car-body capacity that exists between the single-truck car and the double-truck car operated by two men. If the ultra-light car can save enough in first cost, maintenance and power during the off-peak hours to pay for the operation of trippers during the peaks, it is profitable; otherwise the greater capacity of the large single-truck car is preferable regardless of the headway that is necessary to attract traffic. Available information on the cost of operation of ultra-light cars is insufficient as yet to permit even the roughest of approximate estimates on this point, and as some doubt has been raised as to the lasting qualities of excessively light car-body constructions it seems best not to attempt to make comparative figures. There is, of course, no doubt but that the car-building records show a rapid growth for the ultra-light class of cars, but at the same time there is absolutely nothing to show that the class is going to be permanent.

CAR-BODY WIDTHS.

From the foregoing résumé of the existing situation as regards car-body size it is evident that city cars may be very definitely grouped according to their lengths. A double-truck car may be arbitrarily assigned a length of 45 ft. without being more than 5 per cent away from the standard adopted in a large majority of the important cities in the country, while a length of 33 ft. is still closer to the average standard for single-truck cars, if the 35-ft. non-parallel-axle designs are excluded. Ultra-light cars have not yet been built in sufficient numbers to display any ten-



Double-End, One-Man Car for Albuquerque



dencies toward a standard length, but 25 ft. would represent a fair average.

Car-body widths, on the other hand, do not appear to be subject to classification. However, an analysis of the orders for cars that were placed during 1915 and the first half of 1916 shows some rather surprising tendencies toward certain preferred dimensions. Of these orders for new cars, thirty-seven, or nearly one-half, were described in the *ELECTRIC RAILWAY JOURNAL*, and of these

single-truck type, five out of the thirty-seven lots bought during the year being between 8 ft. 3 in. and 8 ft. 1 in. wide. The latter figure is the low limit except for ultra-light cars, of which there are three in the list, ranging from 7 ft. 8 in. to 7 ft. 10 in. Extremely wide cars are also limited in number, there being five lots with widths between 8 ft. 7 in. and 8 ft. 9 in., together with one 8-ft., 11-in. car that is operated in semi-suburban service, and one California-type car with the rather astonishing width of 9 ft. 2 in.

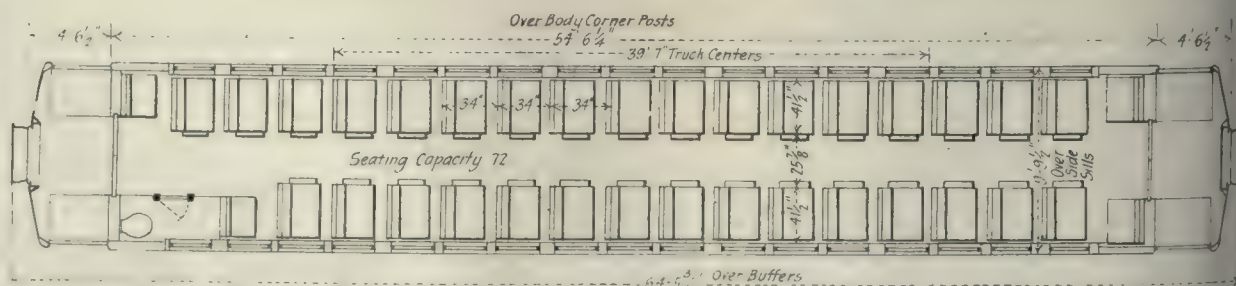
From these figures two important conclusions are inevitable. One is that a width of 8 ft. 4 in. over belt rails would be suitable for some 95 per cent of the localities in which double-truck cars are used, and the other is that this width, although it may not be liberal, is at least sufficient, as exemplified by the relatively large number of cars built with this dimension and by the fact that the Pittsburgh cars are very much narrower.

Of course additional width is always desirable to provide the maximum width of seat and aisle. Yet the accompanying Table VI, covering seat and aisle widths of a number of modern city cars, shows that with a not unreasonable seat and aisle, a total width materially less than 8 ft. 4 in. is easily obtainable. In this table the widths are measured over side sheets instead of over the belt rails so as to eliminate the variable item of belt-rail thickness. The figures in the column headed "Side-Wall Thickness" represent the sums of the dimensions for thickness of side sheet, side-wall insulation, and clearance between the insulation and the outer edge of the seat cushion on each side of

TABLE VI—WIDTHS OF AISLES AND CROSS SEATS FOR RECENT CITY CARS

Car	Width over sheets, ft.-in.	Side wall thickness, in.	Aisle width, in.	Seat width, in.	Remarks
New Orleans.....	8-5	1½	26	37	Window sill overhangs seat 2½ in.
Empire United Railways.....	8-3¾	2¾	25	35	
Bay State.....	8-2	5	24	32	Low window-sill, flush with seat.
Wilmington.....	8-2	1	24	36	
Des Moines.....	8-2½	1¾	23	36	
Baltimore.....	8-2	2½	21¾	36	Wooden car, Low side-plates under seat.
East Liverpool.....	7-11½	1	21½	36	
Kansas City.....	8-6¼	17½	28½	35	Window sill overhangs seat 1¼ in.
Boston (trailer).....	8-4¾	1¾	28	35	
Pittsburgh (Single-end).....	7-9¾	1½	24¾	33½	

thirty-seven lots of cars, no less than nineteen had widths over the belt rails which ranged from 8 ft. 4 in. to 8 ft. 6 in. Of the orders for cars narrower than this only one was for a double-truck car, this covering equipment 7 ft. 10⅞ in. wide that was built for Pittsburgh, where extremely narrow streets and sharp turns are the rule in the business district. The other narrow cars are of the



Motor Car for Suburban Service on Electrified Division of Pennsylvania Railroad



the car; or, in other words, the distance between the seat and the outside of the side sheet.

Judging from the figures in the table a seat width of 35 in. cannot be called unduly narrow since it appears for cars in the list that are not cramped for width. Also, an aisle width of 24 in. seems to be at least an average, while a side-wall clearance of $1\frac{1}{2}$ in. is evidently quite possible, especially in view of the possibility of increasing the effectiveness of over-all width in various ways. One of these is to have the window sill overhang the edge of the seat at the passenger's waist line, as noted for the Kansas City and New Orleans designs, and another is to have a low window sill flush with the seat, as noted for the Bay State car. Then, if a side-wall clearance of $1\frac{1}{2}$ in. is accepted as permissible, together with a 35-in. seat and 24-in. aisle, the width over side sheets would become 8 ft. 1 in., and if $\frac{1}{2}$ -in. belt rails were used, the width over these would total only 8 ft. 2 in.

THE LOCAL CONDITIONS FALLACY

It is evident, therefore, that a width of 8 ft. 4 in. at least could be adopted by the great majority of electric railway properties, and this fact, together with the previously mentioned possibility of length grouping demonstrates that the influence of local conditions on over-all dimensions is, after all, almost negligible. As a matter of fact, the importance of the whole theory of local conditions as affecting car-body dimensions has been greatly exaggerated in the past, and the belief that each community required a car-body of special size has been quite unwarranted. If differences in capacity should exist logically, they should, as already outlined, vary at least roughly in proportion to the size of the com-

munity, yet the record of recent construction demonstrates that this is anything but the case.

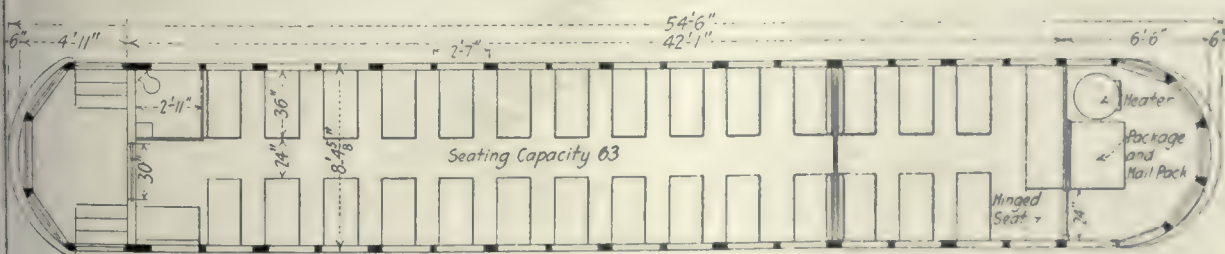
The latest equipment in New York City, for example, is decidedly smaller than that in Rochester. Des Moines, with a population of 86,000, and Pittsburgh, with 534,000, have standardized on practically the same design. The latest Chicago and New Orleans cars are almost exactly alike, notwithstanding the different characteristics of the two cities and their respective populations of 2,100,000 and 330,000. Binghamton with 37-ft. cars has a population of some 50,000, while Charleston, S. C., with 58,000 people, uses 41-ft. cars.

Summed up, the local conditions theory, as applied to general dimensions of car-bodies, is plainly a fallacy. For city cars maximum widths may be desirable, but anything over 8 ft. 4 in. is not essential. Maximum lengths are, perhaps, essential, but these have been limited by experience to about 45 ft. for one class of equipment and to about 33 ft. for another class, with a possible third class, in the vicinity of 25 ft. long, in process of development. Minor variations from these sizes are wholly unnecessary.

CAPACITIES OF HIGH-SPEED CARS

Cars in high-speed service are manifestly free from either of the dominating factors that control the size of city cars, since the influence of schedule speed arises only from the indeterminable number of stops made throughout city runs, and the influence of headway is of relatively negligible importance in interurban service and heavy electric traction. The dominating feature for high-speed cars is, therefore, one of clearances.

On steam roads, right-of-way clearances are well



Light Interurban Car for Cleveland & Eastern Railway

established, and they give arbitrarily permissible dimensions up to about 70 ft. in over-all length and about 10 ft. in over-all width. Interurban cars would, no doubt, approach these figures except for the fact that, normally, interurban service requires operation in city streets. It is true, however, that the route through a city to the terminal may be selected with regard to the clearance problem so that interurban cars may be both longer and wider than city cars operating in the same terminal towns. But this factor, in general, keeps length, and especially width, much less than in cases where private rights-of-way are used altogether. Suburban cars and those on the border line between suburban and interurban service range apparently between 8 ft. 6 in. and 8 ft. 8 in. in width, the former figure being common in the case of city cars. True interurban service, however, appears to call for widths from 8 ft. 9 in. all the way up to 9 ft. 6 in., while length ranges from 55 ft. up to about 61 ft. Seating capacities, as mentioned before, vary widely because some of the cars have baggage com-

partments that cut as much as one-fifth from space available for the installation of seats.

Rapid transit car capacities are even more strongly influenced by clearance limitations than those for interurban service. There is, however, an obvious tendency to adopt the largest possible size of unit in new constructions, where clearance lines may be established arbitrarily to suit the rolling stock that is to be operated. This is in evidence in the subway cars of both the Boston Elevated Railway and the New York Municipal Railway, which have respective over-all dimensions of 69 ft. by 9 ft. 6 in., and 67 ft. by 9 ft. 9 in. Either one of these cars would be considered large even for heavy electric traction. The object is, clearly, limitation of platform expense, and in view of the high first cost of building a subway of large cross-section to permit large cars, the tendency to build large rapid transit cars is further evidence of the workings of the general rule in car design to adopt the greatest dimensions permissible with existing conditions.





Construction Materials and Framing Design

Steel has become universally used for carbody framing within the past five years, although other materials are probably more popular for roof and floor sheathing and for the finish in general. Semi-steel constructions with wooden posts are still used in city service but all-steel city cars are steadily increasing in number, thus bringing about a complete revolution in methods of construction and design which extreme simplicity and universal abandonment of supporting underframes are prominent features.

REFERENCE has been made in a foregoing chapter to the fact that there has been a practically universal substitution of steel for wood as a material for modern car-body construction. This change has been made very rapidly and, naturally, it has revolutionized car design from a structural standpoint, rendering wholly obsolete many types of construction that were common, at least in city service, not more than four or five years ago. As a result there has become common to all new cars the plan of supporting the weight by the sides instead of by the floor framing.

The use of the side framing to carry the weight of the structure as a whole is by no means a new idea, but so long as wood remained the most commonly used material, the practice of building a light superstructure upon a heavy floor construction retained popularity because it was cheap. Since

steel has come into use, however, the heavy underframe has been rendered more costly than side supports, and the "house-on-a-flat-car" principle of construction has given way to the side-girder and truss-side designs.

GENERAL PRINCIPLES OF MODERN DESIGN

Between these two latter types there exist only differences in detail. The side-girder design provides for load-carrying members composed of the side sheathing that extends only between the side sills and belt rails, while the posts are designed merely to carry a light roof. A modification of this is found in cars with steel roof sheathing supported by rather heavy corner posts, the rigidity of the steel roof being said to be sufficient to make the light side posts act as hangers at the center and ends of the car and aid in carrying the load at the

points of greatest deflection. In general, however, the idea of side-girder construction is to make the roof as light as possible, and this, together with certain difficulties that were originally found in making up satisfactory steel posts, has resulted in the establishment and, to some extent, the retention, of the so-called semi-steel car—a design providing for steel-plate girders up to the belt rail, and wooden posts, letterboards and roof.

For side-girder designs this combination of materials is logical, but it is not altogether desirable because it has the inevitable disadvantage of inviting excessive corrosion wherever the wood comes in contact with the steel. Its advantage lies in the fact that, when deflection, or bending due to load, takes place in the relatively shallow girders extending only up to the belt rail, the light roof must bend with it and distort the posts. This distortion involves a certain working at the roof joints, and here the wooden construction has an advantage over steel in that it has inherent flexibility. If steel is used for the posts and roof, the slight working may involve either buckling of plates or else loosening of rivets, and these in turn are frequently followed by leaking joints, rusting and rapid deterioration.

Such difficulties as these are avoided in the truss-side type of construction, in which the whole side of the car is designed to act as a unit, the posts being made strong enough longitudinally with the car to absorb the shearing force that is set up between the roof and the floor when deflection takes place. In consequence, the load-supporting members, or girders, are increased in height from, say, 3 ft. to about 8 ft., and the rigidity of the structure is greatly increased, while any tendency to develop working joints is avoided. For city cars the additional strength and stiffness is very generally considered to be needless, and at the same time the strains are limited because of the rigid track and low speeds, thus reducing to some extent the objectionable features of working posts and roof sheathing. But for high-speed cars the reverse is the case, and this is reflected by the frequent adoption of the truss-side principle in their design.

The essential feature of such a construction appears in a considerable longitudinal width of post, although the effect may be produced without using wide posts by introducing panels at the points of maximum shear which occur a short distance inside of the bolsters and at the extreme ends of the car. The equivalent of such an arrangement has appeared in rapid transit cars where window spacing may be irregular, but under ordinary conditions the matter of appearance seems to be of sufficient importance to warrant the maintenance of the same dimensions for all posts, even though there may be no stress at all upon those located at the points

of zero longitudinal shear, or at the center of the body and over each bolster.

Rigidity in the posts against this shear is generally provided by riveting them to the side sill, the side sheathing and the belt rail and to a deep steel letterboard at the top. However, the thickness of side sheathing has been decreasing very generally, $\frac{1}{8}$ in. having once been almost universal for city cars, while $\frac{3}{32}$ in. is found most frequently to-day, and even $\frac{1}{16}$ in. is not uncommon, and since sheets of less than $\frac{3}{32}$ in. thickness have but a questionable girder strength on account of their readiness to buckle, it is probable that, when the thickness is less than this figure, the side-sheathing plates act only as gussets to hold the heavier members square. Plate thicknesses of $\frac{1}{8}$ in. for high-speed cars are quite common for side sheathing, but when the so-called "unit" type of construction is used, the sheathing serves merely as a protection against the weather and is made $\frac{1}{16}$ in. or less.

In this unit type of truss-side design, each side post, together with half of the window width of letterboard on each side and two diagonal braces at the bottom of the post, are pressed out of a single piece of steel, and by riveting a series of these units to a side sill at the bottom and connecting them together at the top, the whole side framing of a car is formed. No belt rail is needed except as a top for the side sheathing, which, as above remarked, does not assist the load-carrying structure. This, it may be said, constitutes probably the best illustration of the pure truss-side principle that is to be found in modern cars.

SIMPLICITY IN DESIGN

Simplicity in construction has really been forced into existence by the change in car-building methods accompanying the introduction of steel. When wood was the sole material of construction, cars could be almost whittled out from the wood pile. Jigs and dies were practically unknown, and when similar methods of construction were applied to the earliest steel cars, the result was equipment of excessive weight and unreasonable cost.

In the later designs, however, the framework of the body has been simplified until it consists of nothing but a side-sheathing plate, a side sill, a belt rail, posts, carlines and a roof which may or may not include a relatively heavy letterboard or plate. These items, together with crossings that rest on the flanges of the side sills and support the floor sheathing, comprise all of the pieces necessary for the framing of a car between corner posts, and with each addition that the designer makes, just so far does he fall short of his ideal.

Undoubtedly the omission of center sills from the above list of essential members is worthy of comment because this marks most prominently the

dividing lines between the new and the old. During the past two years hardly a single order has been placed for city cars that were so equipped, and in the same period the center sill has begun to disappear from interurban car designs. For heavy service, equivalent to that provided by steam railroads, a form of center sill has been retained of necessity because this is called for by federal rules for postal-car design, but that it is not essential may be judged from the fact that structural members of the cross-sectional area of, say, 24 sq. in. as used for steam railroad equipment will not support themselves across the space between bolsters of long cars, and in consequence they actually have to be held up by crossings between the two side frames. Under such circumstances the center sills have, no doubt, a certain collision strength, but the extent to which they relieve the body framing in case of a collision is problematical. The entire question of collision strength is, of course, less important on electric railways than on steam roads where heavy trains are the rule, this being recognized in the federal specifications for postal cars by the assumption of a buffing load of 200,000 lb. for electric railway service as against the 400,000 lb. specified for steam roads with trains weighing more than 300 tons.

FLOOR CONSTRUCTION.

Aside from the necessity for supporting center sills, the framing for floors has been notable in its adherence to the principle of simplicity, the preferred arrangement being the use of crossings which are framed into the side sills at the bottom of the side sheathing. Vertical strength is provided through connections to the side framing. To give horizontal strength, which is supposed to be necessary to keep the car from being sprung out of line, gusset plates and diagonal members are very liberally installed in high-speed cars. For city cars, as well as those used in light interurban service, diagonal bracing is also used to give horizontal strength to the floor framing, but frequently these diagonals are so long that they may be stretched under comparatively light stresses and, therefore, they fail absolutely to provide any real rigidity.

Within the past few years there has appeared, even for city cars, a tendency to use steel flooring, and when the material is of reasonable thickness and is riveted to the floor framing it would seem to provide ample stiffness in a horizontal plane, although in a recent city car a thickness of only $\frac{1}{32}$ in. has been used, this being plainly incapable of exerting any great girder strength.

Naturally, when a steel floor is adopted there is a very definite need for a covering not only to provide a secure footing, but also to insulate the floor against extremes of outside temperature. Com-

pressed granular cork about 1 in. thick appears to fulfill the requirements very satisfactorily, and with a surface of battleship linoleum it has been utilized in several recent cars. This arrangement has hardly been in electric railway service long enough to demonstrate its desirability under all circumstances, but that it has been used for years on the decks of steamships points to its probable durability, and as a matter of fact linoleum has appeared as a floor surfacer even in some recent cars with wooden floors. Heat insulation for the floors of heavy, high-speed cars very generally takes the form of a layer of mineral wool or some such material, supported on a false floor of thin steel that is located a few inches below the main flooring.

Floorings that are most commonly used include, first of all, wooden sheathing which has the advantages of low first cost and simplicity because it may be attached direct to the floor framing over reasonably long spans. At the same time it provides an excellent footing on its upper surface. It is undoubtedly the most popular material for floor sheathing on city cars. For heavy cars, however, and especially in the case of rapid transit service, the sanitary qualities of a cement composition that may be molded up into smoothly-curving coves at the walls and at corners where dust might readily collect, have been considered of prime importance. Such composition floors, which weigh about $7\frac{1}{2}$ lb. per square foot when made $1\frac{1}{4}$ in. thick, are generally laid upon steel sheets corrugated in various forms to provide beam strength, and these sheets span the space between the side sills and center sills, thus eliminating the need for longitudinal members that would be required with the lighter forms of floor. The use of corrugated steel has involved, in many cases, a rather rapid corrosion throughout the under surface of the floor because of the tendency of flying mud or dust underneath the car to become caked in the hollows. Consequently there has been a tendency to use non-corrodible ingot iron for floors as well as for roofs and side sheathing.

The footing that such composition floorings provide may be made ideal by the introduction of a small amount of anti-slip material in the cement mixture, thus making the whole floor a safety tread in effect. However, specially designed safety treads have come to be universally used on the surfaces of all steps and at bulkhead and vestibule thresholds regardless of the type of flooring. The need for them is obvious, especially in wet weather when the customary wooden steps and wooden vestibule floors are saturated with water and in consequence are slippery. One of the recent developments in this field is the elimination of the metal side housings for the strips of abrasive material which have been common in the past. In this case



Exposed Carline Finish for Ceiling

the abrasive material is completely exposed, being held together by a soft metal binder composed largely of lead. The required durability is attained by the hardness of the abrasive grains.

ROOF CONSTRUCTION

Roof constructions for modern cars, like their floors, are essentially simple in design. The monitor deck has finally been relegated to the list of antiquities, and with the plain-arched roof that has replaced it, the entire roof structure is composed almost invariably of no more than carlines, a roof sheathing and a weatherproof covering.

Generally, the carline spacing corresponds with that of the side posts and it is very seldom that intermediate carlines are used. Steel is a much preferred material for carline construction even with semi-steel cars, this being made possible by the gradually increasing degree of sanity in the railway operators' viewpoint on the contours for arched roofs—a most unimportant feature which nevertheless has made a lot of trouble because of the insistence with which special outlines have been demanded in the past. At present, however, there



Framing for Center-Entrance Car with Steel Roof and T-Bar Posts

is an evident tendency to accept some contour for which the car builder already has dies, and this permits the manufacture of steel carlines at a reasonable cost.

As in the case of the floor, the most popular material for roof sheathing for city cars is wood, because of its low first cost and ready adaptability in application and in weatherproofing. Steel roof-sheathing has certain previously mentioned structural advantages, but it also has serious disadvantages unless the car is of the truss-side design that permits the roof to act in harmony with the framing, this being more common for high-speed cars than for city cars. Nevertheless, there is evidence of increasing popularity for the steel roof in city service in thicknesses as small as No. 18 gage, although it will be a long time, no doubt, before steel, or any of the composition-board materials which also have begun to come into use for the purpose, will surpass wooden sheathing in popularity.

With the steel roof, of course, there are two major difficulties, namely, weatherproofing and insulation. Within the last few years the former has been overcome by electrically welding all seams after they have been riveted, but still more recently a number of cars have been built with a 1-in. layer of compressed cork on top of the steel sheathing, and when this is covered by a layer of roof covering cemented to the cork, the roof is made tight and is insulated as well. Such a construction has the advantage of eliminating the need for headlining, and hence the carlines are exposed in the car interior. From the standpoint of appearance the result, of course, is unconventional, but it is pleasing, nevertheless, because the monotony of the plain ceiling is broken up into panels by the exposed carlines.

Where an uninsulated steel roof sheathing is used headlining is generally considered as a necessity so that a dead-air space may be provided. However, on some very recent cars, designed mainly for summer use, neither headlining nor insulation has been provided. With roof sheathings other than steel the need for headlining is, at least, problematical, although it is very widely used at the present time, presumably because of excessive conservatism in regard to the above-mentioned matter of appearance of exposed carlines. Birch veneer or sheets of compressed wood fiber or equivalent compositions are almost invariably used as a material for this purpose, and the customary thickness of $\frac{1}{4}$ in. makes a weight of 0.8 lb. per square foot or, say, 200 lb. for the whole headlining. This constitutes a material addition to the weight of the roof, which if made of plain $\frac{1}{16}$ -in. steel would weigh $2\frac{1}{2}$ lb. per square foot, or about $3\frac{1}{2}$ lb. per square foot when cork insulation is installed. A

$\frac{3}{8}$ -in. wooden roof sheathing would have less beam strength than the steel, and less gusset strength, but would weigh about $1\frac{1}{4}$ lb. per square foot, including the necessary canvas covering. The latter, it may be said, appears in many recent cars in the form of a specially woven cotton fabric impregnated and coated with a combination of oils to make it weatherproof. This fills the material so that it is necessary to paint only with one coat to give it the desired color. The weight ranges from 3 oz. to 4 oz. per square foot.

POSTS AND SIDE-FRAMING

The wooden side posts that are used with semi-steel cars display no differences from those used years ago when all-wooden cars were the rule, and they warrant no comment except, perhaps, that the straight post has come to be invariably used since the so-called hub clearance for city cars has been given up. Steel posts may be separated into four classes, namely, the T-bar, the tubular, the U-shape and the built-up, and each one of the designs has strong supporters.

Generally, when the T-bar post is used it is so made as to arch clear over the car and thus provide a pair of posts and a carline in a single member. It has, thereby, the great advantage of simplicity, but the necessity for attaching window guides of steel or wood offsets this to a certain extent. Since it has but little rigidity it is incapable of withstanding any great longitudinal shear and it can be used, therefore, only with side-girder designs. This limitation applies also to the tubular post, which seems now to be less popular than the other forms, possibly because of its high first cost. The tubular post, however, is the acme of simplicity once it is molded to form the window guides, and it can be easily repaired, if it is damaged, merely by driving into it a piece of iron that is shaped to suit the various grooves and corners in the original cross-sectional contour.

The U-shaped post lacks the inherent simplicity of the foregoing types, but as opposed to this it is very easily made up or repaired because of the thin metal and the possibility of access to the inside before the cover plate, which is customarily used, is attached. For city cars of the side-girder design these posts are made of, say, No. 16 gage sheet steel, with a cover plate of the same material riveted with exterior joints across the open part of the "U." In some cases the carlines have been formed to the same shape and inserted in the ends of the posts, thus giving the same effect as the continuous T-bar construction previously cited.

The "built-up" post is designed with considerable width solely for truss-side constructions, having two structural members, one at each edge, and a plate connecting the two to give a strut having



Semi-Convertible Car with Sash That Slide Above Headlining

great longitudinal rigidity. The plate thus acts as the web of a girder of which the members along the post's edge (generally angles) serve as the flanges. Such a design is, of course, more complicated and more costly than the other types and it is, in consequence, common only for high-speed cars where truss-side constructions demand great longitudinal strength for the posts.

Side sills for light city cars are frequently 3-in. angles with the lower leg turned horizontally inward, and these members increase in size with harder service all the way up to an 8-in. channel for 70-ft. high-speed cars. The belt rail is generally in the form of a piece of flat steel or a drop-per bar, say, $\frac{1}{2}$ in. x 3 in., or $\frac{1}{2}$ in. x 4 in., the long vertical dimension permitting it to hold the posts rigid when they are attached to it.

At their upper ends the posts are, of course, attached to the letterboard, and this, if made of steel, has a thickness ranging from $\frac{1}{16}$ in. to $\frac{1}{8}$ in. and sometimes, in heavier cars, has been reinforced with horizontal angles. In high-speed cars of truss-side construction the importance of the letterboard is much more likely to be underestimated than over-



T-Bar Posts Combined with Pressed Steel Carlines

estimated, and it is significant that there has been inaugurated a recent design in which the customary ornamental Gothic sash above the windows have been discarded to deepen the letterboard. An approximation of the same idea appears in some cars that have the window rail at the bottom of the upper sash continuous for the whole length of the car, the rail being framed into each side post.

PLATFORM AND BODY-END CONSTRUCTION

With the practically simultaneous development of steel construction and the fully-inclosed car, the platforms for city cars have become more and more an integral part of the body rather than an attachment that merits only secondary consideration. Main platform knees are now made frequently of deep built-up sections with a beam strength corresponding to that of the side girders to which they are riveted, and occasionally the platforms are supported largely by the roof. Sagging platforms are practically unknown with properly designed steel cars, and the auxiliary platform knees near the center line of the car appear to be required to

ment of weakness introduced by the large vestibule-door openings, bulkheads could be eliminated altogether.

In the case of high-speed cars transverse strength for the superstructure has been elaborated in a number of instances by the introduction of a moderately heavy plate running for the entire length of the car and riveted to the carlines, thus acting like the flange of a channel whose web is the side framing. Such a stiffening member, in combination with properly designed carlines, would permit a car to be rolled over on its eaves without destroying the superstructure. This, it may be said, constitutes an argument for a flat roof contour, because when the angle between the roof and the sides at the eaves is a sharp one, the construction approaches more nearly to the ideal condition of strength in every direction that is displayed by a commercial angle-bar.

High-speed car platforms, of course, have always been constructed as an integral part of the car and have developed along lines wholly different from city car platforms. The reason has been that the high-



High-Speed Motor Car for Electrified Lake Erie & Northern Railway

provide support against buffing strains at the center of the crown piece rather than for any supporting effect that they may have.

The end sill, which at one time had a very definite value as the base for the bulkhead in the old box cars, has also lost much of its importance and serves now more than anything else as a support for the auxiliary platform knees midway between their anchorages at the bolster and crown piece. The center-entrance car no doubt has had much to do with the situation, since it has shown definitely that there is no necessity for elaborate provisions, such as were once introduced at the corner posts, to stop weaving of the superstructure. Occasionally, special means for insuring transverse stiffness of the corner posts are installed, but in the main the bulkheads of modern cars are relatively shallow and light structures, dependence for rigidity of the roof being placed largely upon the strong connections between the posts and carlines that have been made possible by the use of steel and the plain-arched form that the roof generally takes. It is obvious, of course, that, except for a possible ele-

ment of weakness introduced by the large vestibule-door openings, bulkheads could be eliminated altogether. speed, end-platform car has for years had its platforms supported on extensions of the center sills which carry also the bumper beams, vestibule housing and draft rigging. The universal use of interior steps for the vestibules has, in fact, practically compelled this arrangement, and under such circumstances the use of heavy bulkheads and end sills has been obligatory. The end sill is especially important because it serves as the last point of support for the out-board ends of the center sills.

In this connection it might be well to mention the scheme used on the Pennsylvania and Long Island motor cars whereby no body bolster is installed, the center plate being attached to the center sills, while these in turn support the car body at the end sill and at a so-called cantilever beam extending across the car at a point equally distant from the center plate. Thus the overhanging ends of the center sills that support the platform are provided with an anchorage which gives a much greater leverage than when the sills are anchored only at the bolster.

Mention might also be made in connection with

the end construction of high-speed cars, of the anti-telescoping construction used for the latest Long Island Railroad trail cars. This consists in the installation of two vertical 12-in. I-beams each framed into one of the two center sills at the bottom and located on either side of the end doorway. At the top, each I-beam is framed into a purlin that extends for the full length of the car and is riveted to each carline that it crosses. Thus the anchorage of the heavy upright I-beams develops the full strength of the body construction as a whole, and before the car could be telescoped it would be necessary to destroy every one of the connections between the side frame and the center sills and purlins that back up the uprights. This arrangement, of course, does not add to the strength of the car against cornering impacts, and here it might be said that the center entrance for high-speed cars has a certain advantage in this regard over the end entrance. The latter, because of the interior steps, depends upon the strength of the bumper beam in a cornering collision, and this has been demonstrated in practice to have not nearly so much

number of cases for sideling below the window sills when an air space is provided next to the side sheathing, and steel is also semi-occasionally used for this purpose as well as for headlining, although the latter use is very rare. Other types of sideling appear in the form of cork covered with linoleum or with canvas cemented in place, and it might be said that the latter arrangement, although it may seem to be incapable of standing much hard usage, makes strong and durable construction.

Sheathing for steel posts is sometimes provided in the form of wooden cover pieces, not so much on the grounds of appearance (although such a finish may be made very handsome), but rather to prevent exposure of cold metal to passengers' hands during low temperature weather. Composition board has been used for this purpose and also thin sheet-steel forms which provide a space that may be filled with mineral wool or some other type of heat-insulating material. The same result has been accomplished more simply when tubular or U-shaped side posts are used, merely by filling the interior of the post with mineral wool.



Semi-Steel Design Adopted in 1913 by Chicago Railways

ability to resist damage as the corner of a car in which the thrust is taken by the actual side framing of the body.

For city cars the problem of buffing strength is confined to the vestibule floor framing, and here the modern tendency of simplicity shows to especially good advantage, since the old-style complication of multiple crown pieces has been discarded very frequently for the plain arrangement of riveting platform knees direct to the anti-climber. That heavy backing for the bumper is not necessary has been definitely shown in practice, steel cars that use only an anti-climber for a crown piece and bumper having stood severe impacts without as much damage as might be expected with an old-style wooden platform.

INTERIOR FINISH AND INSULATION

Reference has already been made to the practically universal use of birch veneer or composition board for the headlining. This is the most important item in connection with interior finish, although its necessity on the grounds of appearance plainly does not exist. Composition board is used also in a

Insulation against noise is a feature of steel car construction that has been brought up only very recently, but it is almost as important as insulation against heat and cold. Of course, the steel car is subject to the evil effects of resonance when passing over rough track or special work, and to eliminate the noise, the plan of deadening all riveted joints has been introduced. This has been accomplished very successfully by inserting, between the two plates making up each joint, a layer of about 1/16 in. of felt. It has been found that this material compresses sufficiently under the riveting pressure to obviate working or weakening of the joint, and at the same time there have been no evidences of burning when hot riveting is employed. The result is that the whole car is thoroughly deadened, and when it is struck with a hammer at any point, the customary ringing sound is absent. In practice a car of this construction has been found to pass over special work with almost no noise that is noticeable, at least to the extent of being objectionable to passengers inside of the car.



Heating, Ventilation and Lighting

Except for improved methods of control, electric heaters could hardly have been retained for modern cars because recent increases in inclosed volume for car bodies and decreases in weight would otherwise have doubled the percentage of the total energy demand that is consumed by the heaters. Requirements of ventilation have also been somewhat increased since the principles involved are becoming better understood, but the energy demands for lighting have been greatly reduced with the practical standardization of systems using high-capacity lamps and vertical glass-ware reflectors to diffuse horizontal light rays.

HEATING, ventilation and lighting of passenger car bodies may be classed as functions which may be only incidental to electric railway operation, but which are, nevertheless, essential to public convenience. That they should be satisfactorily performed is, therefore, a matter of material importance, and in recent years a great deal of attention has been devoted to the perfection of equipment designed with that end in view. However, this has not resulted in the development of any definite tendencies for modern practice except in regard to car lighting, for which general approval has been granted to the semi-direct system with the use of a few large lamps whose horizontal rays are diffused by glassware reflectors. Opinion with regard to heating and ventilating methods is decidedly divided at the present

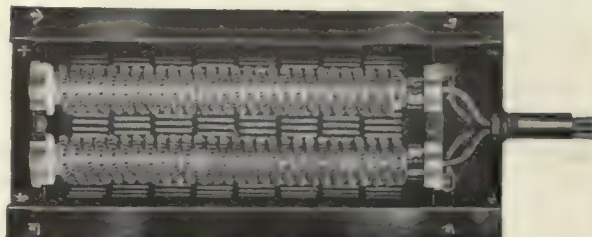
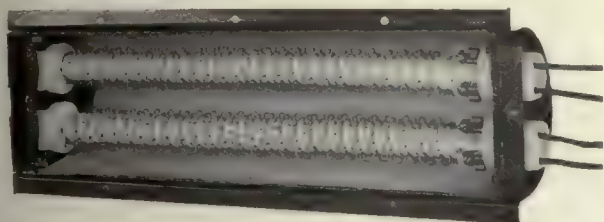
time. This is especially marked in the case of ventilation, possibly because of the unfortunate attempts of a few cities to settle by ordinance the complicated technical questions involved, and the resulting interference with the orderly, if slow, process of survival of the fittest, whereby unsatisfactory methods are invariably eliminated, has left the whole subject in a chaotic condition.

This lack of definite settlement of the ventilation problem has, very naturally, had a disturbing influence on the problem of car heating because the two operations are so closely allied. Thus, an approximate analysis of the expenditure of heat in an ordinary city car, according to the Carpenter heat-loss formula, shows that the loss due to changes of air at the rate of ten per hour is 40 per cent of the whole heat consumption, while the

radiation loss from the windows is only 35 per cent and that from the floor, roof and side sheathing is 25 per cent. If, then, the air changes could be eliminated, the heating requirements would be almost cut in half.

Leaving aside, for the present, consideration of the ventilation problem, two alternatives appear in connection with the heating of cars, namely, the use of the coal-fired heater, generally in connection

Chicago car in which the energy consumed by the electric heaters when on the third point amounted approximately to 7.75 kw., this being equivalent to 3.75 watts per cubic foot of volume within the car body—by no means a high figure, since a unit heater capacity of 4.5 watts per cubic foot of car-body volume has been recommended frequently for localities where zero temperatures are common. The car in question had old-style, non-inclosed vesti-



Typical Modern Electric Heaters

with a forced-draft system, and the use of the electric heater which may or may not be used in connection with a mechanical ventilating system. For modern city cars, the electric heater seems to be the most popular, numerically speaking, the obvious reason being that it is particularly well adapted to the mild climatic conditions that obtain throughout the major part of the country except for occasional cold snaps, and it is only in localities where cold weather is protracted that the coal-fired heater (considered purely as a heating device) has come extensively into competition with it. For interurban service, however, the coal-fired heater is very frequently used because of the greater demand for heat and the greater cost of electric current in such service.

HEATING WITH ELECTRICITY

Primarily the advantage of the electric heater lies in its light weight, low fire risk, low maintenance, reliability, accurate regulation, limited occupancy of space within the car body, cleanliness and freedom from dirt or obnoxious gases. It involves a minimum amount of attention from the car crew, and its appearance is excellent. When used in connection with thermostatic control—a most important development that was introduced a few years ago—the operation is entirely automatic and, to some degree at least, the high cost of the electric energy is reduced.

In especially cold climates this item of operating cost of electric heaters is a serious one. Its importance has been emphasized within the past few years through the introduction of fully-inclosed cars without bulkheads, and also indirectly through the great decrease in car weight that has recently been in evidence. As an example of the way in which this has worked out, there may be cited a widely published test made some years ago on a

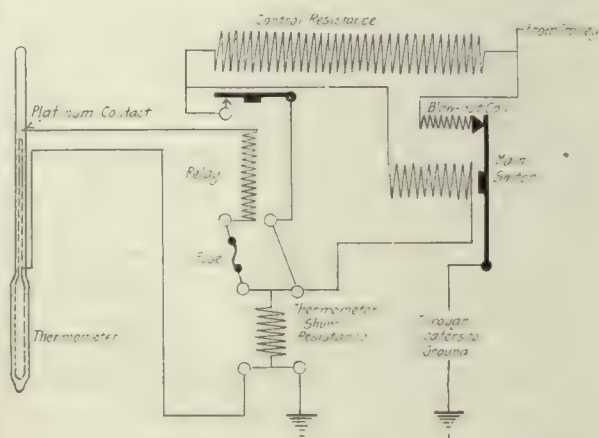
bules and weighed 30 tons, including about 2 tons of live load. The energy required to move the car amounted to 37 kw. on an average, or at 9 m.p.h., 137 watt-hours per ton-mile. In this case, therefore, the heaters added 21 per cent to the load on the power house, and this is by no means an unreasonable figure.

On the other hand, a strictly modern car might weigh only about 15 tons, or with passengers, say, 17 tons. Using the above mentioned unit energy consumption of 137 watt-hours per ton-mile, the total power required for the propulsion of the car must be 23.3 kw. The energy consumed by the heaters, however, is greater in a modern car with fully-inclosed platforms because of the greater volume of air to be heated, the additional volume in the case under consideration being about 30 per cent. In consequence, the heaters would consume, using the same unit figure as in the previous paragraph, about 10 kw. This is no less than 43 per cent of the power required to propel the car. Such a great addition to the normal load involves the equivalent of a separate power house to supply the electric heaters, and since the load factor of heaters is invariably low, the cost of the energy thus required is correspondingly increased, a figure ranging between 2 cents and 2.5 cents per kilowatt-hour being not unreasonable under normal conditions.

Obviously, the major part of this high unit cost for current to supply electric heaters lies in the excessive demand charge caused by the synchronism of the peak of the heater load with the peak of the normal propulsion load. The actual consumption of energy is an almost insignificant element in the cost, and from this it follows that, when synchronism of the two peaks can be avoided, or where cold days are sufficiently rare to permit a heater installation of only moderate size (thus letting the heater load be carried as an overload on the generating

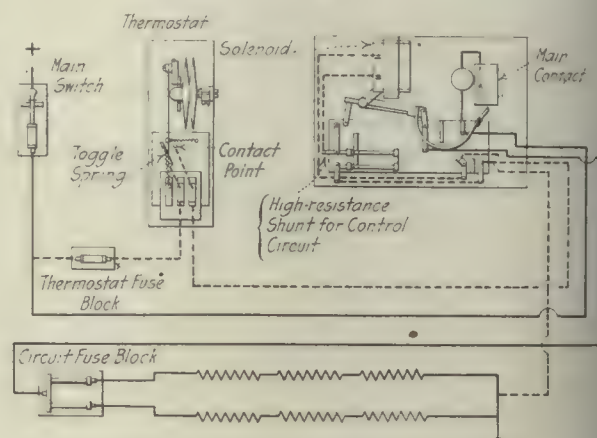
equipment) the unit cost of energy for the heaters may be considerably reduced.

The cost of energy that may be properly charged to the heaters is reduced also when advantage is taken of the heat given out by the bodies of the passengers during the rush hour, the principle involved being that the normal peak on the power house comes only at times when the cars are crowded, and this is the time when the cars are most easily heated. Results may be obtained either by changing the heater control by hand to a lower point of heat when the cars fill up, or else by installing automatic control for the heaters so that they operate only in accordance with the actual needs. The influence of this human heat is a most important item in car heating, since a load of eighty-five passengers gives out approximately the same number of heat units as 10 kw. of heaters.



the movement produced by temperature changes on a receptacle composed of double diaphragms and containing a volatile liquid. Another make uses the movement of mercury in a thermometer, a control circuit being opened when the mercury falls away from a contact point extending through the wall of the thermometer tube.

With all types of thermostat the regulation is extremely sensitive, the thermometer type being able to cut the heaters in or out with a change of 2 deg. in the air temperature of the car. Such devices, therefore, permit the elimination of the two-coil type of heater which has become common in connection with three-point manual control. However, it is a policy of some railroads to have the thermostat operate different heater circuits at different periods according to climatic conditions, and since the only advantage of the single-coil



Arrangement of Apparatus and Wiring for Two Types of Thermostat

Thus, heater tests that are made only on empty cars are meaningless, except to show the worst possible conditions. With a full load of passengers it may be necessary to shut off the heaters altogether.

ELECTRIC HEATER CONTROL

It is, therefore, almost impossible to over-emphasize the importance of controlling electric heat during the rush hour. Control, of course, may be obtained by hand, but it has been thoroughly demonstrated that car crews have neither the time nor the ambition to pay even moderately close attention to the refinements of heater operation. To meet this difficulty, automatic control of the heaters offers the most obvious opportunity, and since thermostats designed for this purpose were placed upon the market a few years ago, they have grown rapidly in popularity, one type, which has been installed on 3000 cars during the past four years, having never had a serious complaint registered against it.

Thermostats for the control of electric heaters appear in several forms. One of these makes use of

heater is a slight difference in first cost, it appears to be considered preferable to install the three circuits of different resistance as normally provided with manual control.

At the present time, therefore, the majority of electric heaters are provided with two coils which may be used either singly to give different resistances, or else in multiple together to give the highest degree of heat. Other features of modern heaters consist in the use of perforated ventilated porcelain cores to support the resistance coils, these perforations allowing air to pass freely through the coil and making the heater wire more effective in giving up heat. Non-corrosive resistance wire is also a feature that has met with considerable popular favor, a nickel-copper alloy eliminating corrosion during the summer months when the moisture is liable to collect upon the metallic surface. This has been known to limit the life of resistance wire to some two years. The desire for reduced maintenance charges has also brought about quick detachable constructions whereby the heater element may be removed by loosening a few nuts, thus mak-

ing it possible to replace an element on the car without removing the complete heater.

Comment might be made here upon the possible savings in current consumption to be effected by thermostat control. Unfortunately, there appear to be no extended tests giving representative figures, but the indications are that the saving will be in the vicinity of 25 per cent of the total current consumption in moderate winter weather, although a figure of 70 per cent has been reported.

However, the really important saving to be effected by the thermostat is not in the reduction of the kilowatt-hours consumed during the course of the heating season, but rather in the reduction of the peak load that the heaters impose upon the power station during the rush hour. Thus, if the full heater load of, say, 10 kw. per car, has to be kept on throughout the rush hour, and if the heater load has to be carried by additional generating equipment rather than by overloading the existing equipment, there would be a charge of \$180 per car per year, approximately speaking, to cover the fixed charges for the demand alone. Yet, the probable energy charge for the current would be only

\$50 per year. In other words, if the peak load for the heaters could be cut in half during the rush hour by taking advantage of the bodily heat of the passengers or by other means, even though the total current consumption might be but little affected, the true total cost of the heat for the year would be reduced by 40 per cent, or from \$230 to \$140. A 7 per cent reduction would cover the first cost of the thermostat.

COAL-FIRED HEATERS

Since the demand for light car weight became pressing, the various heating systems that make use of the combustion of coal have been increasingly limited to the so-called hot-air type of heater, in which ventilating air is warmed by contact with a coal stove and transmitted by a duct to the various parts of the car. The hot-water heater, notwith-

standing its low first cost and its ability to heat the car uniformly and with reliability, has an extremely weak point in its excessive weight, and at the same time it has no advantage over the hot-air heater in the matter of attention required by the car crew, the lack of cleanliness, the necessity for maintenance and the occupancy of space within the car. In city service, at least, the hot-air heater is, therefore, the only modern competitor with electric heat, although the hot-water heater appears on a number of recent high-speed cars.

The feature of either coal-fired system is the low cost of direct operation in which the major item is the expense for coal. Leaving aside the hot-water system because of its restricted field, it may be said that the cost of coal for hot-air heaters ranges from, say, \$30 up to \$50 per year, and the

cost of operation thus compares very favorably with the expense for current of, say, \$200, that may be involved in city service with the electric heater. The first cost for the hot-air system, including the installation of the air duct, is relatively high, being from 50 per cent to 100 per cent in excess of the cost of electric heaters, and the maintenance, owing to



Coal-Fired Heater with Nickelplated Trimmings Installed in Parlor Car of Empire United Railways to Reduce the Consumption of Electric Energy Which Is Purchased by this Company

the moving parts involved by the use of a forced-draft fan, is also greater.

In cold weather, however, the cost of operation is so much less than that of electric heaters that when the two are compared upon a basis involving only extreme climatic conditions rather than operation during the whole heater season, the expense of electric heat appears to be absolutely prohibitive. Nevertheless, such comparisons are really meaningless unless all factors are taken into consideration, including the relatively warm variable weather of spring and autumn, the smaller capacity of electric heaters required on account of their ready regulation, and the indirect factors such as cleanliness, attention by the train crew and the like. Briefly, the place for the hot-air heater appears to be in localities where prolonged cold weather is the rule during the winter. If power is purchased upon a

flat rate, this item of cost in connection with electric heat is not of great importance, but where the use of peak-load power is penalized heavily, as it is in some situations, the factor of cost of current may be of even more influence than the climatic conditions in comparing the two systems as it may make the electric heater cost prohibitive and thus compel the use of hot air.

VENTILATION OF CARS SUBJECT TO PRINCIPLES NOT APPLICABLE IN BUILDING VENTILATION

Closely associated with the whole subject of passenger car heating is the problem of ventilation. The temperature maintained by any heating system, in fact, is dependent to practically as great an extent upon the amount of fresh air that is ordinarily admitted into the car body for ventilating purposes as it is upon the radiation losses from the windows and walls of the car. Unfortunately, recent developments have failed to establish even symptoms of a standard for car ventilation either in regard to practice or in connection with the equipment by which it is effected.

Apparently there are two reasons for this situation. One is that legislation on the subject of ventilation has been based upon the practice and principles applying to building ventilation, and these principles are, almost obviously, not applicable to the case of the electric railway car. The other reason is that no legislative enactment has yet made provision for the lack of constant conditions obtaining in railway service, and by this failure to provide flexibility in the ordinances, railways are forced either to take a chance in neglecting to comply with the terms or else must be put to a wholly unreasonable hardship.

With regard to the lack of applicability, to electric railway service, of commonly accepted practice for ventilating buildings, it may be said that the principal difficulty involved is a general neglect of the influence of room volume in connection with systematic ventilation. Existing data on the subject involves in all cases consideration of situations wherein each occupant of the room, or other inclosed volume that is to be ventilated, is accorded a cubic space ranging from several hundred to several thousand cubic feet. Also, in many cases practice is based on what is known as unsystematic ventilation, wherein incidental leakage plays a large part. Diffusion of pure air and foul air is always carried to its logical extreme.

As opposed to these conditions, an electric railway car generally provides a space of only about 30 cu. ft. per passenger, and at least of late years, a very definite attempt to secure systematic ventilation is frequently made. It has become not uncommon to change the air within the car as frequently as ten times per hour, and this is a rate of

air renewal that is twice as rapid as that set by some authorities even for restaurants, where the odors that are the real basis for most agitation in regard to ventilation may be said to be almost a maximum.

An example of the manner in which the factors of cubic space and frequent air renewal apply to ventilation may be given by citing two extreme hypothetical cases. Thus, if a 1-in. by 1½-in. duct contained a stream of fresh air flowing at 1 ft. per second, and if a man placed his mouth at an opening in the side of the duct and breathed only through this opening, he would find the ventilation excellent. As a matter of fact, he would be supplied with only about 35 cu. ft. of air per hour (one-tenth of the amount required in the Chicago ventilation ordinance), but since he would vitiate only about 15 cu. ft. of air per hour this small supply would be ample under the conditions. However, a supply of 35 cu. ft. of air per hour would be wholly inadequate in a large room. Thus, if the man was in a cell 20 ft. square and 20 ft. high, and if the cell was hermetically sealed except for ventilating openings that supplied 35 cu. ft. of air per hour, he would begin to suffer very seriously after two days and eventually might succumb, provided, of course, that he could not reach the air inlet to obtain fresh air direct. The reason for this contradictory situation is that in the former case the number of changes of air per hour would be 3600, while in the second case only about 0.005 renewals per hour would take place.

It is evident, therefore, that the problem of ventilation for electric railway cars is not likely to be worked out off-hand by the use of data obtained in another field, where the influence of the factor of air change is of minor character, and until more direct information regarding air renewals has been obtained it is certain that the problem will remain in its present chaotic condition. However, recent experience has pointed to the fact that cars in which ten renewals of air are made per hour appear as a rule to be well ventilated.

CARBON-DIOXIDE MEASUREMENTS

In general, it must be recognized that the public invariably considers, and probably will always continue to consider, that ventilation is synonymous with odorlessness. This, of course, complicates the problem because the railway, as a public carrier, is bound to grant transportation to every one requesting it, and a car well filled with workers from a glue factory is hardly likely to be considered properly ventilated by a florist's clerk regardless of the rate of air renewals.

It is this feature of odors that causes carbon-dioxide measurements to be made a part of ventilation tests and brings about their inclusion in ven-

tilation ordinances. Theoretically, the principle here involved is a thoroughly logical one because carbon-dioxide is a tasteless, odorless gas, and the fact that it is an approximately fixed component of air that has been vitiated by human beings permits its measurement to serve as an indication of air quality and the degree of ventilation. Tests based upon such measurements are absolutely independent of the question of odor which, in the main, has no effect upon physical well-being. According to a number of investigators, a proper standard of purity is maintained when the carbon-dioxide content ranges from 10 volumes to 13 volumes per 10,000 volumes of air, the latter ratio being recommended for buildings by the more recent authorities. Thus the standard for breathable air contains roughly three times as much carbon-dioxide as the air ordinarily found in cities, which has generally roughly 3.5 parts per 10,000 volumes.

Although this principle of measurement is logical it has a serious weakness in the great difficulty of its application. In a large room, perhaps, where thorough diffusion of pure air and vitiated air has taken place, measurements may be made with a reasonable degree of accuracy. However, where a rapid renewal of air is taking place and where people are crowded together, as in the case of a railway car, there is every possibility of obtaining readings from pockets of air that contain high percentages of carbon-dioxide, and it is notorious that observers, especially when not exceptionally experienced, always obtain unduly high results.

Consider, for example, a space of 35 cu. ft., through which 350 cu. ft. of air is passed in an hour, so that the air is changed ten times per hour, or once in six minutes. One man in this space will throw off 0.06 cu. ft. of carbon-dioxide during each six-minute period, and if perfect diffusion exists, there will be in the air at all times (allowing for the three and a half parts of carbon-dioxide in ordinary city air) approximately 20 parts of carbon-dioxide per 10,000 volumes of air. If, however, the entering air supply, which is about twenty-five times the amount actually passing through the lungs of the average adult, is brought in at breathing level and the vitiated air is moved upward in a systematic manner, the action will approximate that of the previously cited case where a man breathes from a small duct, and the air that is actually breathed will be of as high a standard of purity as may be expected in a city. The vitiated air rising toward the ceiling of the car will show a content of several times as much carbon-dioxide as in the case of perfect diffusion.

In the ventilating ordinance that was passed in the city of Chicago some seven years ago a minimum air supply of 350 cu. ft. of air per passenger per hour was specified in addition to a limitation of

the carbon-dioxide content to not more than 10 parts in 10,000. Yet the latter provision is clearly impossible of attainment, is indicated, if the specified air supply is 350 cu. ft. per passenger.

If perfect diffusion is established, such an air supply will give a higher carbon-dioxide content than that which is allowed, and if stratification or systematic movement of the air is established, the measurement of carbon-dioxide becomes meaningless. The vitiated air, which invariably tends to rise on account of the warmth and moisture that it takes up in the passengers' lungs, will inevitably show a high content of carbon-dioxide while the air in the lower part of the car will show but a small content, the amount decreasing with the increase in rapidity of air renewal.

INFLUENCE OF VENTILATION ON THE HEATING PROBLEM

The Chicago ordinance constitutes, also, an excellent example of the inevitable difficulties involved in the lack of flexibility of such arbitrary practice. In addition to the minimum air supply of 350 cu. ft. of air per passenger per hour that is called for by the ventilation ordinance, there is specified a minimum temperature of 50 deg. Fahr. On its face, the establishment of these two minimums appears to be within reason, because a maximum load of eighty passengers calls for 28,000 cu. ft. of air per hour to be passed through the car, and the resulting rate of air renewal of, say, ten changes per hour, is well within the capabilities of existing means for ventilation. To heat this amount of air from zero temperature to 50 deg. Fahr. requires 25,000 B. t. u., while the radiation loss from the car body (according to the Carpenter formula applied to a typical fully-inclosed car) would be about 30,000 B. t. u. in addition. To supply this heat are the passengers, themselves, who contribute 32,000 B. t. u., leaving 23,000 B. t. u., or 6.75 kw. to be supplied by the heaters—a perfectly reasonable figure.

Unfortunately, the above estimate applies only to constant conditions, and constant conditions do not obtain in surface car operation. In the first place, there is the opening of the entrance doors which may temporarily overwhelm the heating system. In the second place, if the passenger load happens to be reduced from eighty to, say, ten, the heaters will have to supply the heat that would otherwise have been produced by the seventy passengers who have left the car. This makes a total demand of 51,000 B. t. u., or 15 kw. per hour. The heater load would thus become about two-thirds of the energy required to propel the car, and such a demand for heat would involve prohibitive operating cost. The only alternative would be the employment of an operator on each car to adjust the



Exhaust Ventilators on Modified Arch-Roof Car

ventilators to the continually changing passenger load.

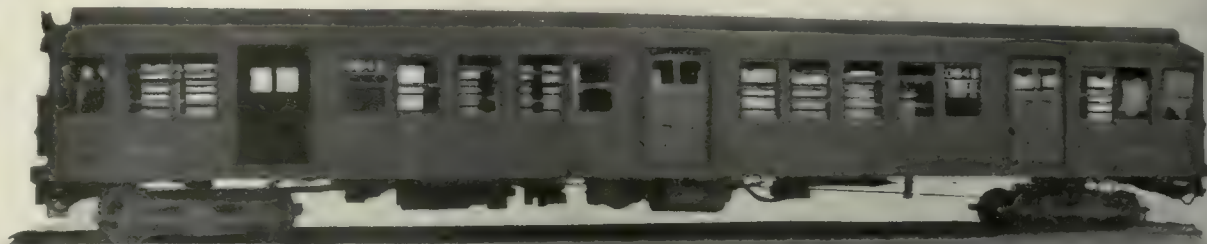
From the foregoing it is obvious that the establishment of combined heating and ventilation rules by ordinance, even when the terms are as apparently moderate as those in Chicago, is practically certain to be unreasonable at times. The logical procedure, if such legislative interference is inevitable, is the selection of either heating or ventilation as the more important and the establishment of a single standard covering only that feature. Yet in the end there is too little definite knowledge on the subject of ventilating railway cars, as opposed to the ventilation of buildings, to permit the general acceptance of any arbitrary set of rules at the present time, and the establishment of such rules can hardly have a beneficial effect in accelerating a solution of a problem that needs so much study as that of car ventilation. Even the various forms of ventilation equipment that are available to-day display wide differences in principle, although it is certain that each one of the different types must have been successful, at least under some circumstances, to have permitted its perpetuation.

VENTILATING EQUIPMENT

Such ventilating equipment may be classified roughly into four general groups. These are (1) the forced-draft, hot-air system; (2) the diffusion

system; (3) the mechanically operated vacuum system and (4) the automatic vacuum system. Still another type might be cited in the case of the monitor-deck-sash system, but since this requires a stretch of the imagination to be classed under any circumstances as a ventilating system, and since it is rapidly disappearing because of the weight, cost and structural weakness of the monitor roof, it may perhaps best be left out of consideration.

Of the four systems, the most prominent example of first named has already been mentioned in connection with the subject of coal-fired heaters. In this case, heat for ventilating air that is discharged into the car is provided by passing the cold air from the intake around the fire-pot of an inclosed coal stove. The cold air is drawn in by means of a small motor-driven fan and is discharged into a duct along the floor at one side of the car. In general it is difficult to consider this apparatus as a ventilating system without reference to its action as a heater, because its most important point is an ability (in case a demand existed for such large units) to provide, without abnormal expense, an unlimited amount of air heated to any desired temperature. Yet the features that apply purely to ventilation are not without weight, one of them being the definite maintenance (unless strong exhaust ventilation is also installed) of air pressure within the car so that air leakage is always outward, thus avoiding localized drafts of cold air around the



Boston Subway Car Equipped with Exhaust-Type Ventilators



Pacific Electric Railway's Heavy Interurban Car Equipped with Diffusion Type Ventilators

windows and reducing the effect of blasts of air coming through open entrance doors. As a ventilating system, also, this form of equipment constitutes an excellent example of systematic ventilation provided that the air supply is sufficient to afford definite stratification and the regular movement of air from the floor up to the outlets in the roof. In practice, however, it is certain that some diffusion takes place, air renewal being accomplished ordinarily at the rate of, say, five or six changes per hour, and such diffusion, which is brought about through the relatively rapid horizontal discharge of fresh air at the floor, aids in preventing the short-circuiting of currents of fresh, warm air direct to the roof outlets use.

Mention should be made here of a plan for ventilation that has been used to some extent with hot-water heaters. In this a fan capable of handling 500 cu. ft. of air per minute is installed in the forward compartment of an interurban car, drawing fresh air from the roof and discharging it into ducts that extend along the floor line back of the hot-water pipes. The discharge of this air across the heater pipes warms it, so that it rises, and after it becomes vitiated it passes out of the car through exhaust ventilators in the roof.

As opposed to these methods, the diffusion system of ventilation involves the use of both an exhaust and a fresh-air intake in the roof. A typical

form consists of a vertical deflector plate extending at right angles to the direction of motion of the car so that the wind piles up air pressure in front of the plate and produces a vacuum behind it, and since an opening into the car interior is provided on either side of the deflector, the forward opening acts as an air intake and the rear opening as an exhaust while the car is in motion. The principle involved is the diffusion of vitiated air by a plentiful supply of fresh air from above the breathing level in the car, as well as a constant agitation which prevents the establishment of pockets of bad air in the upper part of the car. Tests have shown that the intake for a single ventilator may be as high as 100 cu. ft. of air per minute, and indicate in general that only 85 per cent or 90 per cent of this amount of air is discharged at the exhaust. Consequently, this system of ventilation also establishes a slight air pressure within the car, the difference between the amount of air taken in and the amount exhausted necessarily finding its way outside through crevices at the doors and windows. Based upon the flow at the intake, the number of changes of air in the whole car may reach thirty per hour, and assuming that perfect diffusion is effected (or that none of the fresh air at the intake is discharged immediately through the exhaust) a carbon-dioxide content of ten parts should be possible of attainment. If only the upper half of the car (or



Exhaust Ventilator Arrangement for Arch-Roof Car

the space above breathing level) is considered as being affected, the carbon-dioxide should be maintained at eight parts per 10,000.

In the mechanically operated vacuum system a small exhaust fan with a motor of 1/3 hp. capacity is mounted under the roof and this is operated continually at such capacity as to discharge from the car interior an amount of air equal to 350 cu. ft. per hour per passenger under the maximum loading conditions. Air intakes are provided in the side sheathing and air from these is led by horizontal ducts to intake boxes under the car seats. In each



Combination Ventilator-Registers and Lamp Fixtures

intake box is an electric heater, so that the fresh air is warmed as it enters the car. When considered only as a ventilating system this arrangement is, no doubt, highly efficient if a sufficient number of intake boxes are provided, because the fresh air is bound to rise slowly past the seated passengers, thus providing them with pure air without necessity for diffusion.

The simplest of all of the existing ventilating systems involves the use only of exhaust ventilators. This plan has the advantage of requiring the installation of no moving parts, and the first cost is low. The ventilators depend for operation upon the aspirating action of wind across an orifice or else upon the ejector action of a blast of air in-

duced by the motion of the car. For their simplicity they pay the penalty of dependence upon leakage of air around the doors and windows to provide fresh air within the car, although it is probable that, when the car movement is rapid, a double current of air is established in the ventilator, so that there is a small diffusing action as well. Naturally, when the windows and doors are kept reasonably tight, the reduced leakage of air to supply the ventilators must bring about a relatively strong vacuum in the car interior, and this probably exceeds that of the mechanically operated vacuum system because of the unrestricted intake passages of that arrangement.

LIGHTING OF CARS REVOLUTIONIZED BY MODERN HIGH-EFFICIENCY LAMPS

None of the confusion of ideas and widely divergent principles of design that are apparent in connection with car ventilation apply to the subject of car lighting. Here the comparatively recent development of the metal-filament incandescent lamp has practically eliminated the question of current consumption as a vital factor, since the new lamps require only about 1.25 watts per candle-power as against 4 watts needed by the old style, carbon-filament units. In fact, this permits lighting at an expense for power of, say, 1/2 cent per car-hour, together with lamp renewals, amounting to, roughly, 50 per cent of this sum. It has been shown that, with an investment for an improved system of metal-filament lamps, with fixtures and reflectors, at an approximate cost of \$20 per car, the interest earned on the investment, based on saving in cost of operation per car per year, amounts to more than 50 per cent.

The major feature of such modern car lighting systems is the use of large lamps, this condition resulting logically from the relative length and slenderness of the commonly used tungsten filaments, as compared with those made of carbon. The physical weakness of the tungsten lamp that is thus introduced shortens the average life, especially where vibration exists, as it does in railway service, and the obvious alternative is to increase the thickness of the filament and reduce its length either by increasing the lamp capacity, or else by reducing the rated voltage.

This practice of using large lamps has become so generally recognized as an essential in car lighting practice that some electric railways have taken up the rewiring of old cars to obtain the economy in maintenance accompanying the use of large capacity units, and to-day the popular sizes appear to be 56 watts and 94 watts, corresponding to ratings of from 45 c.p. to 80 c.p. per lamp, although 23-watt and 36-watt lamps are occasionally used. A life of 1400 hours with 56-watt lamps has been re-

ported in service tests as against only 400 hours for the 23-watt size, although the manufacturers claim for both types a life of 1200 to 1500 hours. It should be noted that the energy consumption of these two sizes are respectively 1.16 watts and 1.34 watts per candle-power.

In consequence of the reduced number of units, lamp arrangement has come to be practically standardized upon a single row of five or, if necessary, ten lamps along the ceiling. Lamp spacing with the large units appears to make comparatively little difference, intervals of 5 ft. and 6 ft. between lamps being common. However, a remarkably elaborate series of tests carried out on the New York Municipal Railway cars indicates the existence of a limit to lamp spacing, because with two experimental lamp arrangements having the lamps more than 11 feet apart, the lighting was extremely uneven, although another arrangement with a spacing of slightly more than 7 feet gave very uniform results.

The preferred size and number of lamps for the main lighting of cars of various dimensions appear to be about as follows: For car bodies having lengths up to 25 feet, five 56-watt lamps; for bodies up to 35 feet in length, five 94-watt lamps; for bodies between 36 feet and 45 feet in length, ten 56-watt lamps, and for bodies longer than 46 feet, ten 94-watt lamps.

The second essential feature of modern car lighting is the use of diffusing devices to prevent the glare from the direct rays of an unprotected filament emitting light of high intensity. Without such diffusion, which in extreme cases has even taken the form of frosted lamp bulbs, the use of large lamps would be anything but desirable because of the resulting unevenness of light distribution, as well as the direct eyestrain imposed on passengers through the brilliancy of the localized sources of light. Of course, these diffusion devices diminish the amount of illumination provided by the lamp to an extent depending upon the absorption of light during its reflection or transmission. The loss may be as high as 50 per cent, but on the other hand, the true effectiveness of the illumination is increased enough to offset it, in large part, through the elimination of shadows and under-illuminated portions of the car body.

The expense involved by such net loss as may exist is rendered insignificant by the high efficiency of the modern lamps and reflectors, together with the general use of white enamel paint for car-body interiors. This latter, in several cases has been found to increase the utility of illumination by more than 50 per cent over that obtained with an interior finished in yellow or green and, as a consequence, the interior painting of electric cars shows a decided tendency toward the use of white.

In general, for such modern lighting systems,

energy consumptions appear to range as low as from 1 watt to 1.5 watts per square foot of floor, leaving an average effective illumination at the reading plane, 42 in. above the floor, of from 4 foot-candles to 7 foot-candles at normal voltage. The minimum permissible average illumination in this plane appears to range from 2 foot-candles to 3 foot-candles, these figures providing for a voltage variation of 15 per cent or 20 per cent from normal.

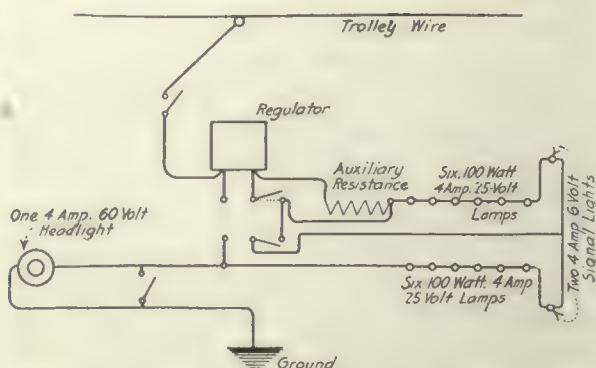
Diffusing devices which are provided for the lamp and which in general are reflectors as well as diffusers, are available in many types and styles



Modern Lighting System Installed in Old Car

and they provide for all classes of illumination from direct to indirect. Popular approval, however, seems definitely to have settled upon the semi-direct system with the use of translucent or clear-prismatic reflectors that are sufficiently deep to prevent the lamp filament from being seen except from directly below.

The principle of this arrangement is, obviously, to direct the greater part of the light downward onto the reading plane, since the eyes of passengers are protected from vertical rays by their hats and eyebrows. At the same time a material amount of soft, diffused light is transmitted through the so-called reflectors, and this prevents glare and violent contrasts. Some opposition to the use of



Wiring Diagram for Voltage Regulator for Lighting System

such reflectors has arisen from a belief that the advertising signs above the car windows would not be brilliantly lighted. As a matter of fact it has been found that a sign that is evenly illuminated, with no obstruction in the way of glare from a bare lamp, is more easily read and has more advertising value than a sign that is brilliantly illuminated but is placed before a bare lamp so that the passenger is compelled to read through an intense glare.

RECENT PRACTICE IN LIGHTING EQUIPMENT

Recent practice indicates, therefore, that reflectors should be at least translucent and deep enough to prevent direct sight by passengers of any lamp filament except the one immediately overhead. In addition, it is obvious that the reflector must be susceptible of easy cleaning, since it may, if covered with dust, absorb some 50 per cent of the light directed upon it from the lamp. Therefore the comparatively smooth, plain, heavy-density opal reflectors have acquired a considerable popularity, although they are obviously less efficient in transmitting light than the reflectors made of clear glass with prismatic corrugations. The difference between the two, however, is not a material item and decision as to the choice of translucent or clear glass reflectors seems largely to be made on the basis of lamp arrangement.



Typical Prismatic Reflector

Thus, with a given number of lamps of a certain size, a shorter car body may make use of opalescent reflectors, while a somewhat longer body might better be equipped with prismatic reflectors than with lamps of a larger size.

Obviously the use of a reflector entails also the use of a fixture to support it, the cost of reflector maintenance being divided between renewals on account of cleaning and breakage, and adjustment of damages due to reflectors falling. A satisfactory fixture must therefore provide for quick and easy application and removal of the reflector and also for a sure grip on the reflector to prevent its falling when the car is in service. One such typical device consists of a number of metal fingers which engage the neck of the reflector and which are sufficiently rigid to hold it temporarily when it is being inserted in the fixture. As an additional safeguard, a lock in the form of a cap-nut can be adjusted on the threaded portion of the fixture until its conical inner surface bears against the metal fingers and absolutely prevents the release of the shade.

It might be noted here that the working of tungsten lamps at less than rated voltage materially increases the life. The increased life is said to vary as the fourteenth power of the reduction in voltage, on which basis a 114-volt tungsten lamp in a 110-volt circuit will have its life increased by 60 per cent. For interurban cars, of course, the voltage variations are very much greater than this, and the lamps are alternately operated at an excessive temperature and then are practically extinguished. To avoid this difficulty several devices have been tried out, the simplest one among them being a regulator which has been used for some two years on the Milwaukee Northern Railway and which consists of a series of relays that cut varying resistances into the lighting circuit as the voltage rises above an arbitrarily established minimum.

Other recently developed features in connection with car lighting that might be mentioned include a selector switch for short-circuiting any lamp in the lighting circuit that is burned out, an extra lamp being placed in the circuit in its place. This is considered especially advisable on cars lighted from a single circuit because the loss of one lamp would put the whole car in darkness and make the replacement of the damaged lamp a difficult matter. Vestibule step lighting has very naturally become popular with the introduction of fully-inclosed platforms, and a large number of cars are so equipped, the lamps being placed sometimes over the door and sometimes under the threshold for the vestibule entrance, the light in some cases being put in circuit only when the doors are open.



Doors, Seats and Miscellaneous Interior Equipment

Inclosure of vestibules, which has come to be a feature of practically all modern electric railway cars, has brought about the development of many different styles and combinations of doors and steps, generally hand-operated in city service but air-controlled on heavy cars. Modern seats are frequently characterized by improved forms of cushion, permitting closer spacing with greater knee-room, and similar provisions for the convenience of the public appear in the extended use of sanitary interior fittings.

EQUIPMENT for the car body, in addition to that provided for heating, ventilation and lighting, has been very generally subject to the same rapidity of development during the last half-decade that has characterized the car body as a whole. The entire matter of vestibule doors, for example, has arisen practically since 1912, before which time the fully-inclosed car in city service was a rare exception, whereas at present an almost infinite variety of vestibule door and step arrangements are available for use. Vestibule equipment has also been affected by the elimination of bulkheads, and head lights of the incandescent type have acquired a greatly extended field. In regard to windows the methods of housing have undergone, in general, a complete change since the introduction of the simplified type of side frame construction that

are common to modern city cars. Seats have been characterized recently by decreased weight to meet the ever-growing demand for light equipment, and the development of light-weight, non-corrodible or sanitary fittings has helped to bring about almost a revolution in the interior appearance of car bodies that have been built within the past few years.

FOLDING DOOR AND STEP MECHANISMS

As outlined in the chapter dealing with the car body from an operating standpoint, the type of door that most frequently appears on modern city cars is of the folding design, and with it there is frequently installed a folding step. In brief, the popularity of this arrangement has been due to its light weight and simplicity of installation, and these features, together with the limited travel of the



Non-Sweep Doors and Interior Step
Used in Pittsburgh



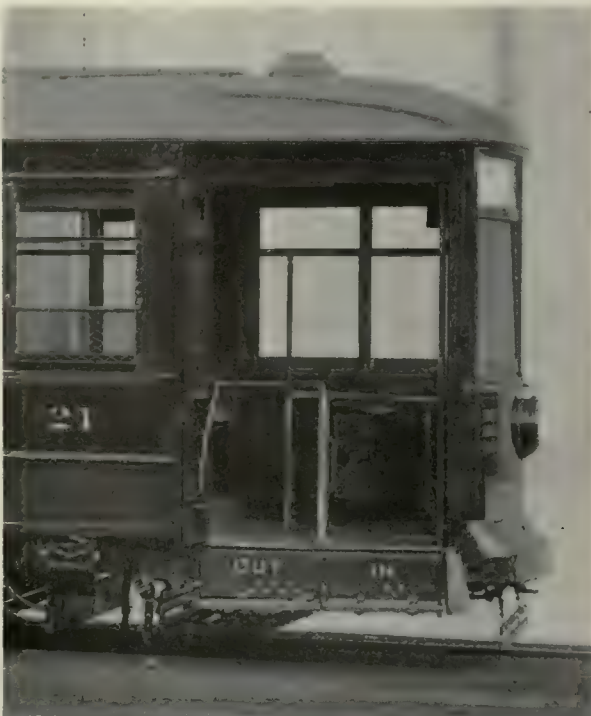
Semi-Outwardly Folding Doors and
Folding Step



Semi-Inwardly Folding Doors and
Folding Step



Outwardly Folding Doors and Stationary Steps as Used on Latest Connecticut Company Cars



Inwardly Folding Entrance and Outwardly Folding Exit Doors



Inwardly Folding Doors and Stationary Steps

folding door when opened, have offered a desirable contrast to the sliding door which, of course, had been brought to a high state of perfection in rapid transit service long before the folding door came into general use.

In its construction the folding door is exceedingly simple, the door itself being hinged vertically in halves and attached to a vertical shaft which supports the whole arrangement. The shaft is supported in ball bearings that are attached to the side of the doorway and these bearings constitute the only ones that are required for the door alone, the runners, top and bottom, being required merely to guide the door so that it will take a position along the line of the threshold when it is extended.

For the folding step which is frequently used in connection with the vestibule doors for city cars the operating shaft is horizontal and a coil spring is wound on it and attached to the step and to the step brackets to counterbalance the weight. Operation of the step is effected by attaching to the step shaft a bell crank of the same length as that which operates the vertical shaft for the door. The two bell cranks are connected by rods to the same operating handle and hence the door and step operate together.

Single folding doors as above described may be used for openings up to about 28 inches in width, but for door openings that are wider than this double doors are generally used, either mutually or independently operated by handles at a control stand on the platform.

Movement of the door requires but little force, and hence manual operation is very generally adopted. Naturally this makes for a moderate first cost for such installations, and as a result there appears to be a recent tendency to equip city cars with front exit doors that are as wide as the entrance doors at the rear, the object being to permit two streams of passengers to alight at the same time through the forward exits at terminals or at intermediate points where a large number leave the car.

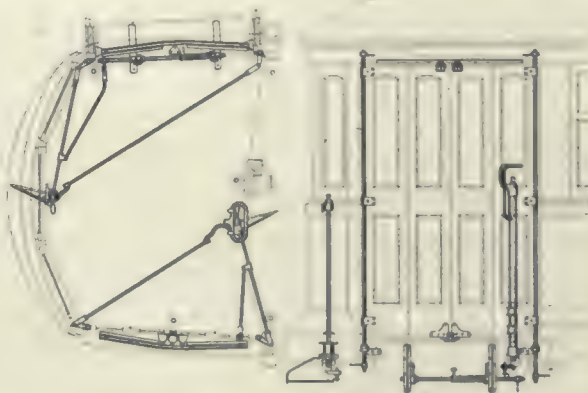
Previous mention has been made of the fact that the majority of doors are made to fold outwardly because an inward movement may be interfered with by passengers who are waiting to alight. From a structural standpoint, also, inwardly-folding doors are not favored, because a weather joint cannot be made at the top and bottom, while outwardly-folding doors generally extend about 1 in. above the door lintel and the same distance below the edge of the platform floor and thus keep wind and rain from blowing into the vestibule.

For vestibule doors generally the evident tendency is to use glass panels for practically the whole height of the door, the aim being to give a clear view of the street close to the step from any point on the platform. There is, however, an apparent

division of opinion as to the use of wire-glass for these panels, since some recent cars have been provided with clear glass and others with the less fragile but more expensive material. For the exit doors in a number of recent designs the bottom door panels have been made of wood, with the evident object of reducing the amount of glass on the car and thus diminishing the expense for glass replacement; but this arrangement does not appear to be universal by any means, the belief being evident that there is need for a view of the pavement opposite the exit just as there is at the entrance.

SLIDING DOORS AND DOOR ENGINES

The sliding door, of course, is universally used in rapid transit service because it has the very definite advantage of a minimum transverse clear-



Arrangement of Apparatus for Folding Door

ance. Its weight and amplitude of movement, however, seem to call for a door engine rather than manual operation. Pneumatic door engines for this purpose have been brought to a high state of perfection, so that the possibility of catching the clothing or body of a passenger between the door and the door post has been absolutely eliminated, and if desired a door may be made actually to retract after hitting such objects. Control is effected either manually, by mechanical connection to the valve on the pneumatic engine; electrically, by push-buttons or special switches connected to the magnet valves on the engine; or pneumatically, by means of a small air valve located adjacent to the conductor. Any one of these types of control permit a door to be reversed at any point in its travel without slamming, but, in addition, air cushions are invariably provided so that the movement of the door is retarded during the last few inches of its travel. For city service the door engine is of importance when remote control is desired, and in several such instances engines have been installed, one case being where suburban runs required the conductor to go inside the car to collect second fares. Here electro-pneumatic operation from remote points within the car was essential to rapid operation.

With power operation for sliding doors, the factors of weight and amplitude of movement are nullified; but for city cars the necessity for a longitudinal recess into which the door can slide is an objectionable feature of material importance for structural reasons. However, sliding doors have been used to some extent for exits, having been adopted for the Cleveland front-entrance, center-exit car's center doors, although the front-entrance door of this car is of the customary four-panel folding type.

The non-sweep or folding-and-sliding type of door, which is a modification of the sliding door that obviates the need for a door pocket, has a peculiar movement, in that the door slides around the inside of the corner existing between the plane of the doorway and the side of the passageway leading to it. In one such arrangement the motion is defined by guides and runners which compel one edge of the door to travel straight in and out transversely with the center line of the car and the other edge to travel straight across the threshold. The result of the combined movement of both edges is to make the door as a whole slide into open position around a sharp curve, taking its open position at right angles to the doorway and in line with the door post. The operation is effected by a pair of bell-cranks housed within a space above the door and only a few inches in height.

NON-SWEEP DOOR OPERATION

This type of door has been used for several years in Pittsburgh and some other cities. Its advantage over the sliding type lies in the easier action due to the character of the movement. Also, it may be used for independently-operated double center doors, because in this case the two half-doors that are in the middle fold practically out of the way in line with the center post of the doorway, while with the sliding type of door a space must be left between the double doorways into which the middle half-doors may slide, unless the advantage of having small half-doors is given up and full-width sliding doors are installed across the whole doorway on either side of the center post. Obviously, the non-sweep door does not extend beyond the edge of the car when it is open; and yet the operation of opening cannot be interfered with by passengers ready to alight, as in the case of a folding door that folds inward. This feature, it may be said, is the reason for the non-sweep door's development in Pittsburgh because clearances are reduced to an absolute minimum, and the extension of even an open door beyond the side of the car is likely to result in trouble. The influence of this condition appears also in the location of the grab handles at the doorway, these being mounted upon the door so that when the door is closed the grab handle is inside of the car.

The weight and first cost of the non-sweep type

of door appear to be about the same as that of the folding door. Its ease of operation is about similar to that of doors of the folding type, and it is generally operated by hand. With pneumatic control the operation is not as satisfactory as in the case of folding or sliding doors, owing to the fact that the non-sweep design appears to slam more than the other two types. There is, of course, in common with the inwardly-folding door, a small clearance space under the non-sweep door which does not exist with the outwardly folding type.

MISCELLANEOUS VESTIBULE EQUIPMENT

Trapdoors for vestibules, which are used to cover interior steps, especially in the case of cars for heavy electric traction, have been made mutually operative with the entrance doors in some instances, the trapdoor movement being effected in the same manner as that of a folding step. An innovation that has been brought out within the past two years provides for a horizontal movement or extension of several inches for the trapdoor when it is in lowered position. Thus the car may be operated on a foreign road that has raised platforms with clearances appreciably greater than the width of the car, the extensible trapdoor filling the gap between the edge of the platform and the car side. The extension is effected by a simple mechanism which is operated mechanically by pulling on a folding mast-arm located within the vestibule, and provision is made so that the trapdoor cannot be extended while the vestibule door is closed, thus eliminating danger of having the projecting edge of the trapdoor cause damage by being inadvertently left extended while the car is in motion.

For end-entrance, double-end, high-speed cars the vestibule, of course, serves as a motorman's compartment, but for single-end and center-entrance cars special partitions have to be installed in case the motorman is to be separated from the rest of the car. In city service the importance of seating space makes the use of collapsible compartments desirable, and these appeared in different forms in several of the early center-entrance cars. At present there is in evidence a tendency to omit such permanent compartments, especially since end doors under the control of the motormen have appeared as a feature of recent modified center-door arrangements. Therefore, the most popular plan is to have the motorman separated from the body of the car only by a curtain drawn down behind him. The use of railings as an additional means of separation for the motorman appears also in a number of recent city cars, and in one case he is virtually placed in a separate compartment by the use of three curtains, one at his back and one at each side, these being carried normally on rollers hung from the vestibule ceiling. The reasons for this tendency to omit par-

titions are, obviously, the desire for retaining full seating space within the car, to give the motorman better control of the customarily-installed front door and, at the same time, to maintain simplicity in the interior construction. On this basis the controller and brake valve have even been located under permanent end seats extending around both ends of center-door cars, and the connections for the controller and air-brake handles have been carried up through pipe railings that act as seat spacers when at the rear of the car.

With the practically universal use of air brakes for city cars, seats for motormen are becoming a customary part of the vestibule equipment. From the plain round stool on a pipe standard these seats have been developed to provide adjustable height by a cam or ratchet in some cases, and in others to

the main power supply, and in one such scheme there is used a back contact relay that closes a shunt circuit through a storage battery and low-voltage circuit if the power supply should fail, the circuit serving small lamps located in the markers alongside of the large lamps that are normally lighted. The storage battery is kept charged by a shunt connection from the main circuit, and thus the car is provided with marker lights even when the power supply is interrupted. Frequently emergency interior lamps and emergency illumination for the headlight are also provided by shunt circuits with storage batteries. Still another item worthy of note in connection with frequent development in vestibule equipment is the cab telephone, which may be connected with the company telephone wire by plugging into a jack box on a pole



Pneumatic Engine for Sliding Door



Sliding Doors Set Outside of Car Framing

provide either for collapsing the seat against the vestibule sheathing or for its removal to the opposite end of the car in case that proceeding is preferred when the car is turned. Seats for the conductor have been installed occasionally so that he is in position behind the fare box but still can observe the entrance doors, and on the early center-entrance cars in New York City the conductor was seated behind a small change desk opposite the entrance. Nevertheless, the provision of special seats for this purpose has not acquired general popularity, because fare collection and door control seem to be performed much more efficiently when the conductor is standing and he has a chance to sit within the car on long runs.

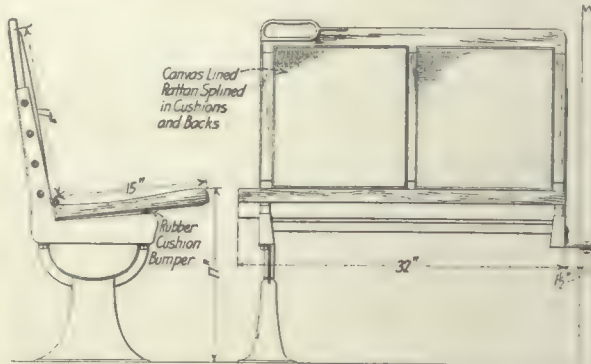
Other items of vestibule equipment on recent cars include provisions for electric marker lamps instead of oil lamps, which have been generally used because of their reliability. Electric markers, of course, require provision against interruption of

near the track or by getting connection by means of a pole having on the end a metal hook that may be caught on the bare telephone wire overhead.

HEADLIGHTS

Headlights, at least in the case of interurban cars, constitute an important item of vestibule equipment. For city cars an incandescent headlight recessed in the dash of the car and operated in series with the car lighting is most generally used. In general, the equipment consists of a metal reflector within a cast-iron casing equipped with a plain glass door, although several companies make use of a semaphore lens, which produces a longer and more concentrated beam. For suburban service the headlight is generally powerful enough to throw a beam from 400 ft. to 500 ft. ahead of the car; but this, of course, is not so brilliant as to blind pedestrians when the car is operating through city streets. These headlights are frequently mounted

permanently on the car dash, although in some cases portable headlights are used so that they may be shifted from one end of the car to the other. In suburban equipment the modern tendency is to make use of a concentrated-filament Mazda lamp that is mounted in a headlight with a silver-plated glass



Non-Reversible Folding Seat for Ultra-Light Cars

reflector parabolic in shape. A focusing device is usually considered essential in order to obtain the best results. In some cases headlights are operated in series with the car lighting, but usually they are supplied from an independent circuit containing resistance. In addition, dimming resistances are sometimes provided so that high-powered headlights may be controlled but not extinguished when circumstances make a strong beam undesirable.

For high-speed service modern practice appears to require headlights that will produce a beam of sufficient intensity to enable the motorman to pick up objects on the track from 1200 ft. to 1500 ft. ahead of the car, and there is some difference of opinion as to whether the high-powered luminous-arc headlight or the incandescent headlight is better adapted for these conditions. The arc lamp has retained a great deal of popularity because of its ability to give a constant illumination when operating on fluctuating voltage; but opposed to this there is the objection of the wandering of the beam, although the latter difficulty has been largely overcome of late by the use of flattened electrodes. Arc headlights are equipped with parabolic reflectors where a widespread beam is desired for use on single-track lines. For double-track service a semaphore lens equipment gives a more concentrated beam and does not interfere with cars approaching from the opposite direction.

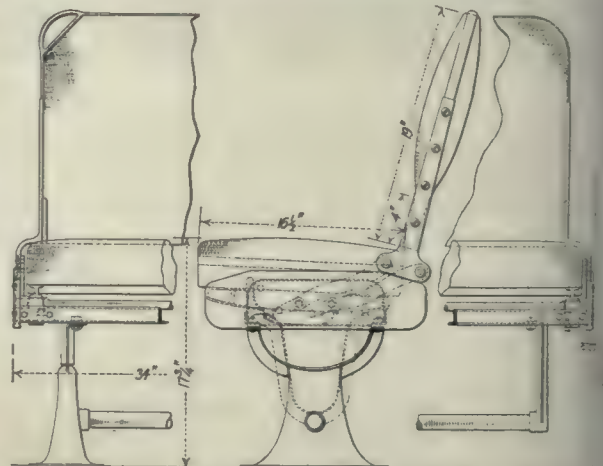
Within recent years a number of high-speed electric railways have adopted incandescent headlights that are essentially similar to those designed for suburban service, except that the reflectors are made larger in order to produce a longer beam. These headlights are nearly always portable and are mounted on the car dash, although some few roads giving a fast, heavy service use incandescent headlights mounted permanently above the vesti-

bule. The obvious advantages of the incandescent headlight are its simplicity and absence of moving parts. In addition, a very important recent improvement has been effected through the development of a reflector that absorbs the high-frequency rays from the lamp and thus makes the headlight emit a greenish-yellow beam of light without violet or ultra-violet components. The principle upon which this is based is that the glare from high-powered headlights, which has been shown to be actually dangerous in extreme cases because of its blinding effect on motormen of opposing trains and its tendency to make light signals fade out and lose arrestiveness of aspect, comes largely from the ultra-violet rays. The practical elimination of these rays, therefore, permits the use of a high candle-power lamp that can give an intense beam of light without the usual objectionable features.

In general, the problem of the relative advantages of incandescent and arc headlights resolves itself into the question of voltage. If there is a steady supply of constant-voltage current the high-capacity incandescent lamp may be employed to best advantage. If, however, the headlights are to be operated direct from the main power circuits the luminous arc headlight is generally considered to meet the requirements in a very satisfactory manner because of the variations in voltage that will inevitably occur.

SEATS AND SEAT CUSHIONS

With regard to seats for electric railway cars, it has already been remarked that a transverse arrangement has become practically standardized in



Typical Reversible Seat

all classes of service and, since the large majority of newly-built cars are designed for double-end operation, reversible seats are now almost invariably installed. Ruggedness and light weight are the major considerations in the mechanism by which reversibility is provided, and recent improvements along these lines have been more in the nature of evolution of existing constructions than novelties in

design, although perhaps the substitution of pressed steel for the originally-used malleable-iron pedestals might be classed as a radical change of past years. As a material for seat cushions rattan is overwhelmingly in the majority for city cars, although the wooden-slat seat has been gaining in favor, especially for ultra-light designs where thinness of the seat back and lightness for the seat as a whole are of special importance. In interurban service plush is still the most popular seat covering, although rattan cushions are being used to an increasing extent in both smoking and passenger compartments. At present, imitation leather is probably most popular for smoking compartment seats, and it is occasionally used in main compartments as well.

Within the past two years no small amount of attention has been devoted to the design of a proper form for seat cushions. The major point raised is that, since the seat back is a support for the shoulders only, any extension of the seat back below the shoulders of a seated passenger is not only unnecessary but becomes actually harmful by pushing the body forward at the plane of the seat. The principle is indicated in the accompanying illustrations, of which one shows the theory and the other one of its recent applications in practice with the preferred dimensions. From the latter it may be seen that a depth of $15\frac{1}{2}$ in. in the clear is called for, this being somewhat less than the dimensions that have commonly prevailed for some years. However, this provides considerably more space than would be

the cushion is $16\frac{1}{2}$ in. wide. Practically the full width is effective seating space, owing to the extra throw of the cushion and the formation of the back, which, it should be noted, furnishes increased knee room for the passengers in the seat to the rear.

In connection with this particular seat it might be remarked that although a foot rest is employed, there appears to be a considerable difference of

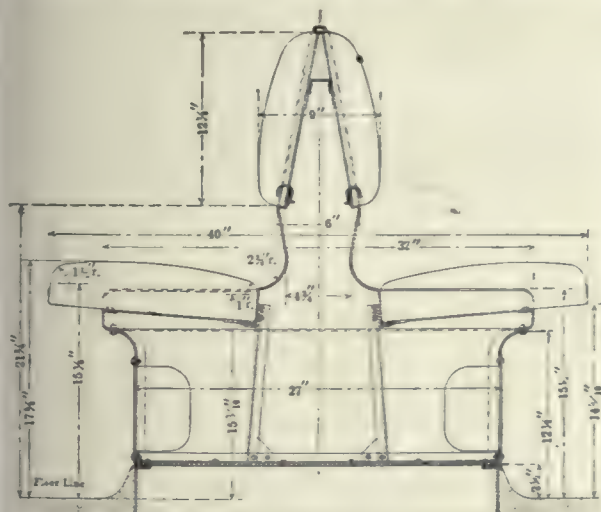


Effect of Seat Design on the Human Spine

opinion on the advisability of such devices, at least for city service. Seats for a number of recent cars have been furnished without any foot rest whatsoever, while in other cases double rests have been employed. Logically, however, it would seem that for city service, where a large majority of the passengers are short riders, the foot rest is a complication that is hardly necessary.

In connection with the recent development of ultra-light cars, a new type of seat is worthy of passing mention owing to its novel features, although it is designed only for single-end cars of especially light construction. This seat is non-reversible, and it is made with pressed-steel end and back standards combined with a pressed-steel pedestal designed so that it centers well back of the center line of the seat cushion. The seat cushion is hinged and can be lifted like a theater seat so as to permit the passenger occupying the position next to the aisle to step back without moving into the aisle in order to allow the passenger occupying the inside seat to move out. This is considered to be of considerable value in small single-end cars where the aisles are none too wide and space is at a premium. The seat weighs but 25 lb., and it is made with a hardwood frame and rattan webbing panels with the idea that these are more comfortable than wooden slats and make a better appearance. It is reported that this construction is as durable and is more easily repaired than the plain slat seat.

So far as the widths for seats may be considered, there is, as mentioned in a previous chapter, no evident tendency toward any standard dimension, 35 in. and 36 in. being frequently but not invariably used for city service. For interurban cars the seat widths are, of course, increased, ranging up to about 41 in., including seat arms,



Preferred Dimensions for Correct-Posture Seats

otherwise installed because of the overhang of the seat-back cushion.

The influence of this theory in seat design appears in a number of the most recent cars for city service, one such design being shown in the accompanying line cut. This is a light-weight reversible seat with a width of 34 in. and a weight of about 60 lb. The back is shaped thin at the bottom, and

when that width can be provided without cutting down the clear aisle-width below about 22 in., although a 25-in. aisle seems to be more popular when this clearance can be obtained. Forty-three-inch seats, it may be said, appear on one of the latest interurban cars.

WINDOWS AND CURTAINS

Not a great deal of change has been apparent in connection with the construction and operation of car windows within the period under discussion except for the practical elimination of the space-wasting drop sash and the development of metal sash frames. The latter, however, seem recently to have lost somewhat in popularity, and one reason that has been put forward for this lack of general acceptance of a feature of such obvious advantage is that the expansion and contraction of metal is so much greater than that of wood under extremes of temperature that it becomes a difficult matter to keep the sash tight, although means designed to overcome this have been provided in one design by the use of a filling of compressible composition in the groove that holds the edges of the glass. Such sash is formed into the necessary shapes from seamless brass tubing, and the bottom sash rail is furnished with a rubber strip which prevents shock in case the sash is lowered violently and protects passengers' hands in case they should be caught under the window, acting at the same time as a bottom weather strip.

For city service the two-section window with a high bottom section is still the rule, although the very recent Bay State car has three-section sash.



Interurban Seat with Cushion Removed to Show Reversing Mechanism

For semi-convertible cars popularity appears to have been accorded equally to the two arrangements which permit the sash either to be removed completely from the car or else to be raised on curved guides into a space between the roof and the headlining. The former arrangement, of course, re-

quires only that the sash guides on posts shall be readily removable, so that the appellation of "semi-convertible" to cars so equipped is rather finely drawn; but the fact that only a small percentage of recent cars have provision for removing the sash perhaps permits this classification.

Sash locks for holding windows in open position



Modern Slat Seat with Bench Removed to Show Reversing Mechanism for Sliding and Tilting Movement of Bench

are available in a very great variety of forms. The simplest types make use of such arrangements as a bolt engaging with holes drilled in the side posts at various heights, or a cam pivoting on a pin in the side post and swinging against the sash frame so that the weight is held up by friction. Among the more elaborate forms might be cited a safety lock with a corrugated guide that cannot be improperly latched and fall through carelessness on the part of the passenger. Window guards in many recent cases have been made of wire screens instead of the horizontal rods that are usually of $\frac{1}{4}$ -in. steel tubing or lightweight metal spaced on, say, $2\frac{1}{2}$ -in. centers. Generally, such wire mesh screens are stationary, being needed as a guard only when the sash is removed, but in one case the guard is attached to the bottom of the lower sash of each window, and it slides into a pocket in the side wall of the car below the window sill when the sash is lowered. This arrangement, of course, eliminates any difficulty introduced by the presence of the window guard in connection with washing of the windows. Other schemes for simplifying the window washing process may be cited in the case of arrangements where guards of the horizontal-rod type are supported in multiple castings that are hinged on the center rod so that each half of the guard may be swung outward by loosening the clips that hold the castings to the posts under normal conditions. Another similar plan is the sup-

port of the guard on vertical rods rather than direct attachment to the posts, so that the whole guard can be raised or lowered.

Window curtains for recent cars have displayed a surprising unanimity in connection with the material that is used for the curtain itself, imitation leather on a cloth base having been used in practically all of the most recent equipment orders. Novelties in the construction of the curtain fixtures have not been prominent since the introduction of combined pinch handle and friction devices which prevent the curtain from creeping upward, but recently there has been brought out a fixture that makes use of a double-acting, automatic friction device on the roller tips, permitting the curtain to be pushed up or pulled down without fric-

tion. The back of seats have been made also with enamel covering as well as of lightweight, non-corrodible, aluminum-base metal. This latter material has a silver finish that does not tarnish, and therefore adds greatly to the appearance of the car interior, although perhaps not as much as is the case with the white enamel porcelain.

Buzzer systems fed with 600-volt current from the trolley circuit are still a part of the interior equipment of every modern car, but there is, apparently, a tendency to discontinue the liberal installation of push buttons that was the original practice. Frequently buttons have been installed, only at or near the exit so that there will be less tendency to delay the movement of the car because of the leisurely movement of passengers who signal



Correct Posture Seats for Rapid Transit Car

tional resistance and without need for pinch handles, although the curtain normally is held in place by friction.

MISCELLANEOUS CAR-BODY EQUIPMENT

Probably the most spectacular of the developments in miscellaneous car-body equipment that have recently taken place is the introduction of a sanitary covering in the form of white porcelain enamel for interior hand holds of various types, including stanchions and hand straps and the grab handles attached to the back of seats. Since the enamel is not affected by acid, it becomes possible to wipe such hand holds with dilute carbolic acid when the cars are cleaned, and thus render the equipment truly sanitary and free from possibility of transmitting contagion. Grab handles on the

to the motorman and then take their time about leaving their seats, but this arrangement has not proved to be invariably satisfactory. In some cases the buzzer has been used as a signal between the conductor and the motorman, and the cord-operated bell has been omitted.

Destination signs for practically all recent city cars have been of the type where a long reel of cloth is wound between a pair of drums, the various destination names being painted upon the cloth and illuminated by lights from the rear. However, the use of numbers for designation of routes has come into use of late, and these are displayed on the car in a number of different forms ranging from perforations in a metal plate to large numbers that are painted upon steel or cardboard and illuminated from the front side.



Equipment for Fare Registration and Collection

At the present time equipment for fare collection displays diverging tendencies, one general class, which includes the locked fare-box and the register, aiming toward the utmost development of the human element and the other toward the sole use of mechanical devices. Elaboration of the various types of apparatus has brought about within the past few years not only the money-counting fare-box but also motor-driven registering fare-boxes, totalizing registers, traffic-mileage recorders, and even transfer-issuing machines.

ALTHOUGH equipment for the collection and registration of fares is really subject to classification as part of the interior fittings of a car-body, it has been omitted from the discussion in the foregoing chapter and treated as a separate division of equipment because of the extraordinary number of improvements made within the past few years, as well as the great importance of the equipment in the operation of the car. Broadly speaking, the recent developments in this field have resulted in the rather surprising situation wherein there is a direct division of opinion over the basic question of manual versus mechanical collection of fares. Thus there are, so to speak, two widely-separated schools of thought in connection with fare collection. One of them involves the use of mechanical means in collecting fares, reach-

ing an ultimate development in the registering fare box, while the other aims solely toward the development and utilization of the human element.

Aside from the equipment that is involved in this general division of opinion, it may be said that the latest devices to be introduced have all been characterized by a tendency toward elaboration of mechanical operation. Among the fare-registration devices, which, of course, antedate the fare box, this tendency appears in the development of totalizing registers which add up the results of the day's operation by mechanical means. For inter-urban service, where the greatest variety of data are involved, opportunity for elaboration in operating records has even been provided by a machine that produces printed data for traffic statistics of a most complete character. Printed register records

with some types of registers are made to include figures for transfers, tickets, passes, cash fares and total passengers. In addition, light portable registers have been gaining materially in importance because of the successful establishment in several cities of front-end collection for congested loading points. One type of portable machine even approximates the action of a coin-counting fare box, and it is used widely in towns of moderate size.

With the coin-counting fare box in general, development has naturally been very rapid because of the relatively recent introduction of the device. In its latest form, wherein the machine is motor-driven, it has unquestionably aided in the elimination of several serious difficulties with which the original mechanical fare-collecting machines had to contend, and the same idea of elaborating mechanical operation also has appeared in the production of registering fare boxes for both cash and metal tokens used for reduced fares. A recently designed fare box includes provision for counting and cancelling paper tickets by mechanical means, although this has hardly reached a commercial stage as yet. Also, there are combined registers and fare boxes which enable a single machine to collect and register automatically the cash fares that are dropped into it, while provision is made on the same machine for manual registration of tickets and transfers; and there has even appeared an automatic change-making machine for installation on the car platform to relieve the conductor of this duty. A similar tendency toward mechanical operation is in evidence, although in a somewhat different application, through the placing on the market of transfer printing and issuing machines.

DEVELOPMENT OF HUMAN ELEMENT IN FARE COLLECTION

That phase of the previously-mentioned division of opinion regarding the means for fare collection which depends upon the development of the human element rather than mechanical apparatus for securing to the company the fares that are collected involves primarily the use of a register alone. Carried to a logical conclusion the fare box is omitted, at least in the registering form, although in numerous instances a non-registering fare box is used as a safe-deposit or receptacle for fares. The basic idea underlying this plan is that real protection in fare collection should depend more than anything else upon the public indication and registration of the fare and the printed record of it. Thus, it is held that the placing of a fare box on the car is an intimation to the conductor that he is no longer to be trusted to handle the receipts. This results in the conductor becoming less interested in getting the proper receipts into the fare box, since he cannot logically be held responsible for something that

he is told to let alone. On the other hand, if fares are registered upon dials or indicators placed at different points within the car to give publicity to the act of registration and the conductor is given authority to reject improper fares, as well as responsible supervision over the sale of transportation, it is considered that real protection for fare collection can be secured.

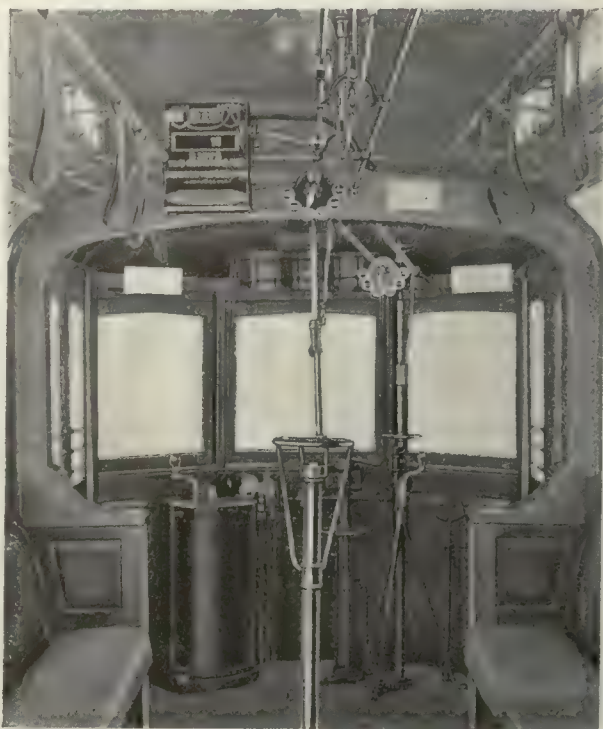
Exponents of this principle advocate the establishment of competition between conductors in regard to their accuracy of handling fares, and records are kept of the shorts and overs that exist between the printed register record and the actual turn-in of each conductor, who does not see the register record and does not know what has been registered when he makes his turn-in. In consequence, he turns in everything that he has in his pocket less his own change. If he is over he is not given an opportunity to hold this amount out, thereby making his turn-in balance with his register. Neither is he required to make up any shortages, and if any conductor is consistently short he is disciplined.

In brief, the basic idea of this system is to make an appeal to that which is best in the employee and to provide means for analyzing the characteristic errors of the various men, thus bringing to the surface those who should be watched more carefully because of carelessness or dishonesty.

FARE REGISTRATION EQUIPMENT

Apparatus for the registration of fares without combination with a fare box has undergone relatively few changes within the past few years, except as regards the previously mentioned development of a totalizing register, of which a typical record is shown in an accompanying illustration. With this device the printing wheels are turned back to zero when each conductor starts to work. Therefore, when the records are figured in the auditing department no subtractions are necessary between the first print made and the succeeding prints with the exception of the total passenger count, thus providing a check between the records of successive conductors and between the closing and opening figures of successive days.

Another recent development in apparatus for fare registration is found in a fare recorder which is operated on the basis of mileage traveled by the person paying fare. Thus, instead of setting the register in terms of money the machine is set in terms of stations or fare points, and the act of setting the pointers to any two given stations automatically computes and records both the distance traveled by the passenger and the amount of fare to be paid. The dial of this device is mounted in the car in the usual manner, but is divided into half-mile divisions covering 100 miles of run. The dial carries three pointers, one indicating the start-



Register Fixtures Arranged for Either One-Man or Two-Man Operation

ing point and another the destination, while the third is provided for arbitrary fares, being moved backward or forward to make the deductions or additions involved by the change from the standard rate per mile. Movement of the pointers and registration is effected by rods running the length of the car in the usual manner. The printed record, which is completed by the automatic printing of the totals



Traffic Recorder for Registering Fares on a Mileage Basis

for cash passengers, ticket passengers, passenger miles and total fares collected, as well as the date, the train and the division, may be made up either at the end of the trip or at the end of each conductor's run, the conductor being identified by signing his name on the record through an opening in the case.

The use only of such fare registers is diametrically opposed to the alternative general plan of mechanical fare collection, if it may be so termed, whereby the use of fare boxes eliminates the human element from the process of collecting fares in so far as this is possible. The underlying idea of the latter plan may, perhaps, be best exemplified by citing the method under which the fares are dropped into a locked fare box without registra-



Fare Box Location on Cleveland Front-Entrance Center-Exit Car

tion—a scheme that was first tried out in the early days of prepayment operation. Here the process of fare collection was wholly independent of the conductor, whose duties were limited to the making of change and to seeing that entering passengers dropped their fares into the box.

MECHANICAL FARE COLLECTION

Theoretically this provided the ideal arrangement from the standpoint of mechanical fare collection. The locked receptacle assured a complete turn-in to the company of the money that was dropped into the box, and the arrangement had the great advantage of simplicity both in regard to accounting practice and in the mechanical construction of the apparatus. In addition, it was generally considered to facilitate loading in comparison with hand collection, because passengers having the exact fare did not need to wait for those getting change or transfers. However, the original arrangement of having a locked fare box without registration of fares has been generally found to be very weak in practice, because dependence has to be placed upon the public to hand over the fares to the box and not to the conductor. Thus it becomes relatively

easy for a dishonest conductor to hold out fares in making change or to substitute for tendered fares coins of lower denomination. The result has been a return to the use of the register in connection with the fare box, and this is the almost invariable practice at the present time, regardless of whether the box is locked or is of the money-counting type.

COIN COUNTING FARE BOXES

Within the last few years the money-counting fare box has become a formidable rival of the locked box. The objects sought in its development as a substitute for the locked box were to avoid the trouble and expense of supplying each conductor with some \$25 in small change each day, as well as



Locked Fare Box Opposite Center-Entrance
on Pittsburgh Low-Floor Car

the expense of removing all of the inner compartments of the fare box, transporting them safely to the auditing department, counting the money and putting it up in sacks to be sent up for the next day for use of change. In addition, it was desired to avoid the necessity for a check on those who did the counting, as well as the difficulty in properly checking the register readings against the fare-box contents.

With the first money-counting fare boxes a serious obstacle was encountered in the mechanical difficulty of counting coins accurately according to value on account of the small difference in diameter between the penny and the dime and the great variations due to wear and mutilation, together with the constant introduction of dirt into the counting mechanism. Several years of experiment, however, as well as experience derived from the increasing use of the machines, eventually served to overcome the difficulties, and within the last two or three years the money-counting fare boxes may be said to have met the conditions of normal operation in a satisfactory manner. When kept reasonably clean they are accurate, and under normal circumstances



Combination Fare Box and Register with Extra Sections,
Permitting Tickets and Transfers to Be Rung Up by Hand

they are reliable and generally give first-rate service. In addition to the refinements of detailed design brought about by practical experience, the money-counting fare box has been brought to a high state of development in its operating possibilities. Among the recent designs that have been introduced is one in which the standard registering fare box has been supplemented by a registering



Coin-Counting Fare Box and Transfer Register
on One-Man Car

box and registered. If a passenger tenders a 4-cent exchange ticket or a transfer, the conductor registers it by hand on the transfer register which with the cash register is located on a stanchion directly above the fare box.

When the passenger drops his nickel in the fare box it falls upon a tilting table, this being hand operated, under the control of the conductor. The money is registered automatically by the motor, which is started by tilting the table, and the fare drops into the bottom of the box, where it is immediately available for change. Therefore, the conductor does not have to spin the operating handle of the fare box nor to operate a register except for transfers, checks and employees' tickets, and he cannot possibly show an honest difference between the money collected and the indication on the register. Also, on a heavy traffic line it is no small convenience to the conductor to have change immediately instead of being obliged to interrupt his work by grinding the fare-box handle.

The old trick of securing a fractional registration with a penny or clipped nickel is useless, because the register will not record anything below a full fare. Furthermore, it is dangerous to the conductor who tries it, because such coins drop into a locked receptacle not accessible to the conductor, and a conductor whose box contains several such coins lays himself open to suspicion. In general, the motor-operated coin register is said to be very popular with the great majority of the Boston Elevated Railway Company's employees, because it relieves them of much work and worry, while there is instantaneous registration of each fare upon a register that is visible and audible from inside the car, thus overcoming one of the weak points of the ordinary fare box.

Generally speaking, the motor-driven fare-box registers are similar to standard hand-driven machines except for the fact that they are provided with a separable base containing a 600-volt 1/15-hp. motor designed for operation on a circuit direct from the trolley. The current requirement is only

1/5 amp. and the motor base contains an automatic switch which cuts off the current as soon as the money in the machine is registered.

TRANSFER PRINTING ON THE CAR

Reference has already been made, in connection with the general subject of fare collection, to the use of transfer-printing machines that may be mounted on the car near the conductor's station to relieve him of the labor of punching transfers and at the same time to furnish a check upon this operation. Such machines have not as yet been produced in large quantities, but the limited number in use at the present time have given successful results, indicating that the principle is well adapted for general electric railway service. The transfers are printed as issued from the machines, which are provided with operating pedals or small hand levers for setting the time and other data to be printed. The transfers as issued are cut from rolls of inexpensive white paper and are neat and sanitary.

The machines are usually so arranged that they can be changed from one end of the car to the other very readily if necessary, and the cost is moderate, involving in the case of one design an expenditure of about \$100. The size is about the same as a coin-counting fare box, and the weights of the different types range from 17 lb. to 35 lb.

Apparently, such devices should be decidedly economical, because they reduce the cost of transfers to the equivalent of that of plain rolls of paper, while the expense of handling and checking transfers is also eliminated. The conductor's transfer record of the day is simply a matter of issuing to himself a transfer upon beginning his work and another upon quitting. He fastens the two together and turns them in, so that the opening and closing consecutive numbers are thus reported, the times showing when he began and finished his run. However, the important element of the device appears to be speed because with one type of machine tests have shown that between sixty and seventy transfers per minute can be easily issued.





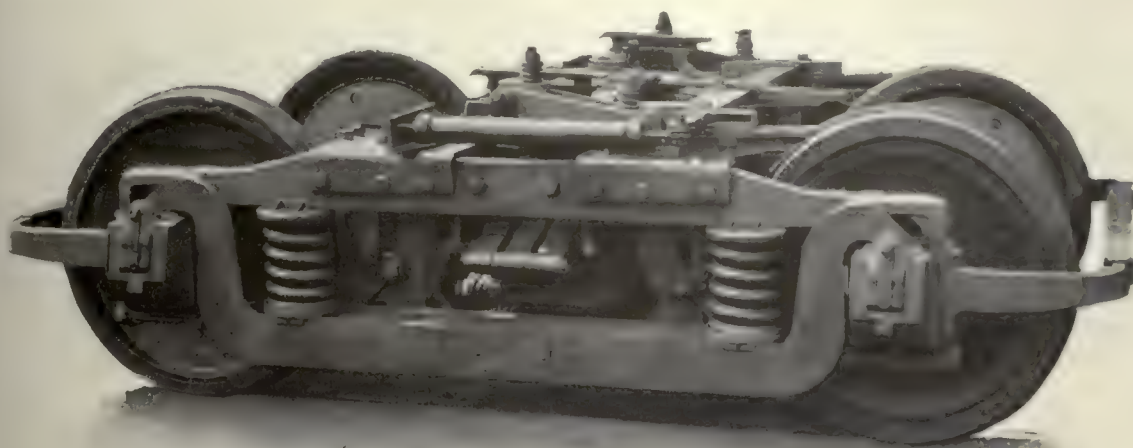
Trucks, Wheels, Axles and Gearing

Many recent trucks have been characterized by the general use of structural shapes and pressings instead of forgings, and they have frequently been simplified by the omission of the once-universal equalizer bars, while spring systems have been improved by the use of coil springs in series with leaf springs. For city service the non-parallel-axle truck has come into use and there is evidence of a tendency toward a return to cast-iron wheels and possibly toward the use of annealed axles and anti-friction bearings

TRUCKS of the four-wheeled swiveling type, which are generally representative of the electric railway practice of this country, have been subject to very little change within recent years, at least in so far as basic methods of design may be considered. However, there appears to be a marked growth in popularity in the use of structural steel shapes that are fastened by rivets in preference to bolts, since bolts generally display a tendency to get loose and yet are difficult to remove in case repair work becomes necessary. In all cases a swinging truck bolster is used to support the center-plate load, the movement of this being absolutely essential to safe and easy riding as speeds increase, although the swing motion has been dampened in some instances by adjustable friction devices.

One of the most important of recent improvements in truck details has to do with this feature, the innovation being designed to eliminate uneven frictional action by the chafing plates ordinarily em-

ployed to hold the bolster between transoms in an upright position. For example, when the car is coasting the bolster is free to ride upon its springs, but when the torque of the motors or the pressure from the brakes forces the bolster against the chafing plates, there is a certain amount of friction, and very frequently a locking effect, which interferes with the swinging as well as the spring action, and may stop it altogether, resulting in rough, jerky riding. By the employment of the new device, which is called a bolster guide, this condition may be entirely removed. The guide is shown in one of the accompanying illustrations of a truck of the M. C. B. type, appearing between the brake release spring and the side bearing on each side of the truck. It consists of a pair of links pivoted at one end to the bolster and at the other to the transom, allowance for play or side swing of the bolster being provided under spring pressure. Consequently, the bolster floats on top of its springs and is held in position



Truck Equipped with Bolster-Guide Links Pivoted to Ends of Bolster and to Transom

exactly parallel with the transom, although it is able to move freely up and down or sidewise to provide swing easement at curves. As the links are pivoted to the truck bolster on the vertical center line of the truck's pivot plate, a dead-center pull on the truck bolsters is established when brakes are applied, and this absolutely prevents the bolster from tilting.

MODIFICATIONS OF THE M. C. B. TRUCK

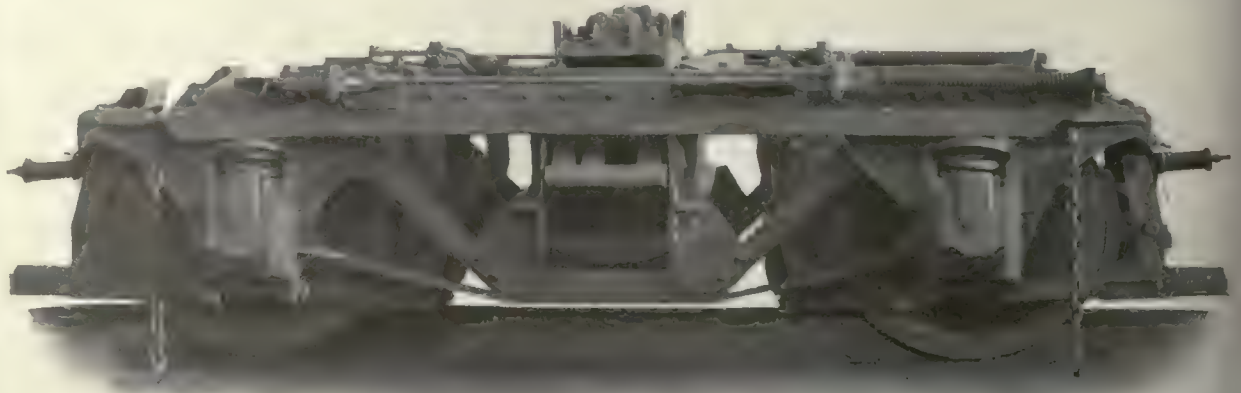
For swiveling city-car trucks, certain variations have appeared in the location of the swing links that carry the bolster, thus modifying the M. C. B. design, in which the links invariably hang from the transoms and support a spring plank that carries the elliptical springs upon which the bolster rests. One of these alternative arrangements is to hang the swing links from the top member of the truck-side, so that they support directly the ends of a half-elliptical spring, on top of which rests the end of the bolster. With such a design the springs are placed lengthwise with the truck-side, and the side movement for the bolster is limited, the springs being rigidly attached to spring-seats at the ends of the bolster. The design is, of course, intended particularly for city service where speeds are low, and its obvious advantage is its simplification or reduction of the number of parts required in the truck.

Modifications of this design make use of spiral springs mounted in series with the leaf springs to absorb vibrations of short amplitude. This method of improving truck spring systems was worked out two or three years ago, and it has been adopted as a part of many recent constructions because it automatically brings into action the soft-acting spiral springs to insure easy riding of the car body under light loads and to cushion the smaller vibrations and shocks.

Notwithstanding the popularity of the above-mentioned plan of hanging the springs direct from the truck side-frame, a number of low-floor trucks for city service have been designed along the line of the M. C. B. design, in that the leaf springs are set transversely with the truck-side and are located on a spring plank hung from the transoms. Such trucks are frequently made up from flat steel bars for the truck-sides similarly to the arch-bar truck commonly used under freight cars. In this case no end frames are used to connect the ends of the truck-sides together, and, as a matter of fact, end frames have been omitted also in many interurban truck designs where both motors and brakes are inside hung, thus showing plainly that the end frame in itself is not essential to the alignment of the truck.

Among the modern trucks of modified M. C. B. type that have been built within the past few years are several which make use of structural shapes and pressings, instead of the flat bars above mentioned. This results in a construction of a great strength and lightness. One such truck, which is illustrated on page 630, has been designed for extremely heavy high-speed service involving an actual center plate load of 48,000 lb., and a maximum center plate load within the elastic limit of the material amounting to about 120,000 lb. The weight of the truck, complete with brake rigging but without motors or gearing, is 12,500 lb.

In general the M. C. B. type of truck is invariably associated with the use of equalizer bars for transmitting the load at the center portion of the truck-side to the boxes, and although this device was almost universally used at one time in electric railway service, present opinion is very much divided as to the necessity for the complication. The object of the equalizer bar is, obviously, to permit movement of one wheel, in case it encounters some irregularity in the track, without compelling



High-Speed Truck Built with Structural Shapes and Pressings to Give Light Weight

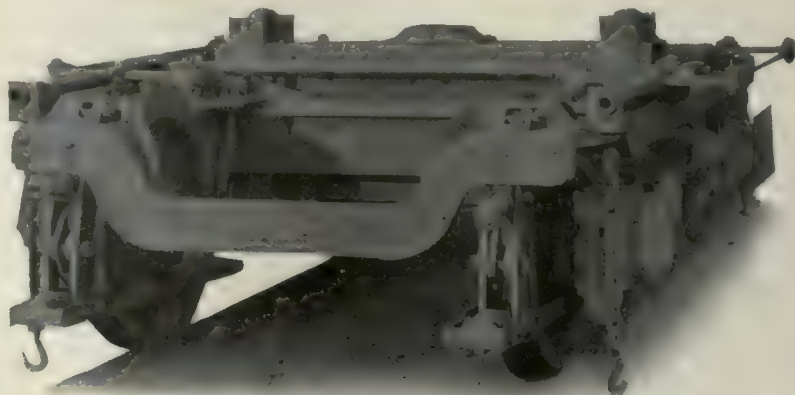
a corresponding movement of the whole side of the truck, and if this result could not be obtained in any other way, there would be ample reason for the construction. However, the use of spiral springs on top of the boxes has proved to be perfectly practicable, and where the matter of height has been important the requisite length and amplitude of movement for these springs have been attained by placing them alongside of the box and supporting them on lugs instead of on top of the box. It is true, of course, that the omission of the equalizer bars must, for a given spring, reduce to some extent the freedom of relative movement between the wheels and the truck as a whole, so that the problem of the use or non-use of equalizer bars would seem to be largely one of track conditions.

However, non-equalized trucks have been used successfully under recent passenger coaches for steam railroads that have been by no means noted for their smooth roadbeds and, in consequence, more than a discussion of principles appears to be required to warrant the retention of the equalizer bar. In fact, in city service the equalizer seems to have been abandoned at the present time, except in very rare instances, because of its weight and its complication of its truck construction.

Where two motors are mounted on one truck, the inside-hung motor arrangements display an overwhelming popularity for recent cars, the possible reduction in wheelbase to be effected by outside-hung motors evidently being an insufficient recompense for the savings in weight and complication that accompany the inside-hung arrangement. Of course, where maximum-traction trucks are adopted, the location of the driving wheels near the bolster necessitates hanging the motor outside of these wheels, but other than this, the use of outside-hung motors to reduce wheelbase to the extremes that were occasionally used several years ago, seems to have been altogether given up. In this connection the influence of modern small-sized motors appears in the question of truck wheelbase, which now ranges down to 5 ft. 2 in. for recent cars having two inside-hung motors per truck.

MAXIMUM TRACTION AND SHORT WHEEL-BASE TRUCKS

In city service the maximum-traction truck has, of course, retained its popularity of some years ago, but at the same time the influence of the small wheel is making itself felt also in this regard, although, on one recent two-motor car, typical maxi-

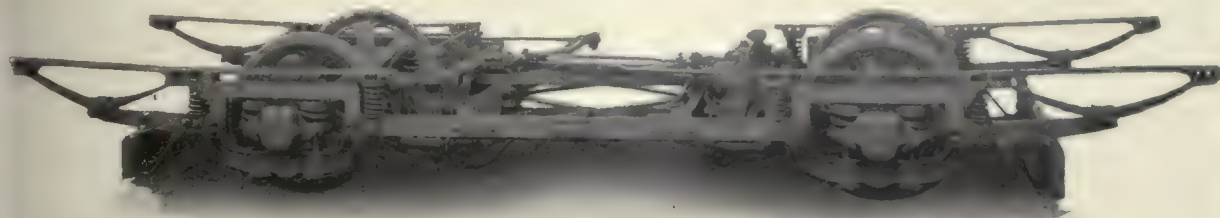


End View of High-Speed Truck Shown Above

mum-traction trucks with 26-in. wheels have been used in connection with the modern small motors. However, in another two-motor city car both motors are mounted on one truck, which has 24-in. wheels, the opposite truck being an idler. For this idler truck 24-in. wheels are used as well as on the motor truck, the reason for not going to a smaller diameter being that the slight saving in weight thus effected would hardly compensate for the greater complication of spare parts that would have to be carried in stock to provide for the maintenance of two different truck designs on each car. In several instances, also, the recognized advantages of the maximum traction truck have been given up in favor of the greater advantages to be derived from the use of small motors, several cars being equipped with four motors and small-wheeled trucks, in preference to the use of the same total capacity of motors in a two-motor equipment with maximum-traction trucks. However, a division of opinion exists on the advisability of this procedure, owing to the fact that maintenance of motors is commonly

previous chapter, and this type has evolved from the form in which it originally appeared largely through simplification and through the substitution of structural steel members for the forgings that were originally common. One such truck, which has been designed for ultra-light cars, has a weight complete with truck brake rigging of only 3,200 lb. For larger cars, single-truck weights increase up to about 6,000 lb., a wheelbase of 8 ft. seeming to be about the maximum that is popular. However, rigid wheelbases up to a length of 8 ft. 6 in. have been used, and it is considered by one manufacturer that a 9-ft. wheelbase could be made to give satisfactory service if necessary.

In connection with the use of four-wheeled cars having rigid axles, mention may be made here of the principle of omitting the truck altogether and supporting the car direct on the journal boxes. An example of this construction is to be found in the ultra-light-weight cars built by the New York Railways for storage battery operation some three years ago, the car in this case being designed with a con-



Typical Non-Parallel-Axle Truck

held to depend rather upon the number of motors to be kept in repair than upon the horsepower of the motors, so that the maintenance of two 60-hp. units would be less than that of four 30-hp. motors.

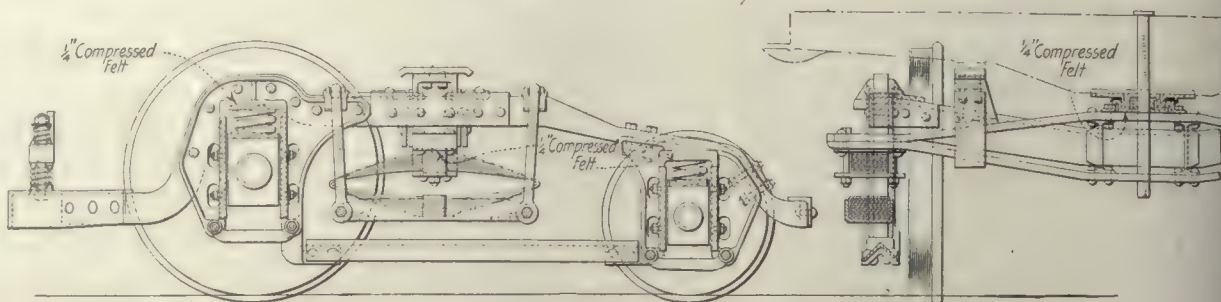
In connection with maximum-traction trucks it might be said that recent designs have almost invariably been constructed for operation with the pony wheels toward the ends of the car, the object being to avoid the loss of adhesion that occurs at the extreme front wheel whenever a car starts. Also, in a recent single-end design this effect of inertia has actually been utilized to good advantage by facing both pony wheels forward, the tilting of the trucks during acceleration increasing adhesion.

TRUCKS FOR LIGHT CARS

Although the double-truck car is really the representative type on American electric railways, the single-truck design has experienced a marked revival within recent years, this being reflected in the number of radically different types that are in use at the present time. Of these, the rigid-axle truck is apparently the most popular, as mentioned in a

siderable hub-clearance, so that the bottom of the side sheathing comes about in the plane of the boxes. The side sheathing of the car supports the entire load and it is reinforced at the journal boxes to provide seats for helical springs arranged in multiple, which constitutes the entire spring equipment. Nothing is installed that is equivalent to the half-elliptic springs that are commonly extended beyond the wheels on single-truck cars to increase the spring base for the car body, but in the case under discussion the speed of the car is at all times extremely low, so that the tendency to pitch or gallop is reduced to a minimum. The use of such multiple helical springs for single-truck cars has been popularized to a considerable extent by the development of the so-called wide-wing journal box which increases the possible length of the spring support of the frames and, with the large diameter spiral springs in pairs on the journal box wings, adds to the strength as well as to the riding qualities of the truck.

The tendency to gallop is, of course, the great difficulty with all short-wheelbase single-truck cars,



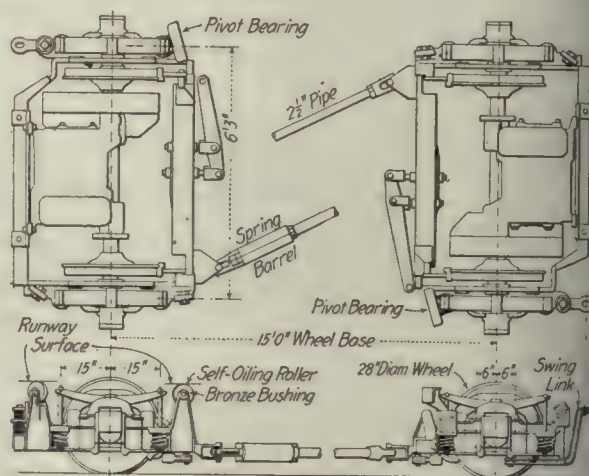
Modified M. C. B. Truck for City Service

the limitation to the wheelbase existing, of course, because of the difficulty of getting the car around curves. To meet the situation the non-parallel axle truck has been developed, and although this has not as yet extended the field for the single-truck car materially beyond its original limits, it displays very definite promise. Existing designs of non-parallel-axle trucks have increased the truck wheelbase from 9 ft. up to 12 ft. and occasionally 15 ft., and by thus decreasing the length of the overhanging ends of the car body the tendency toward galloping has been materially reduced.

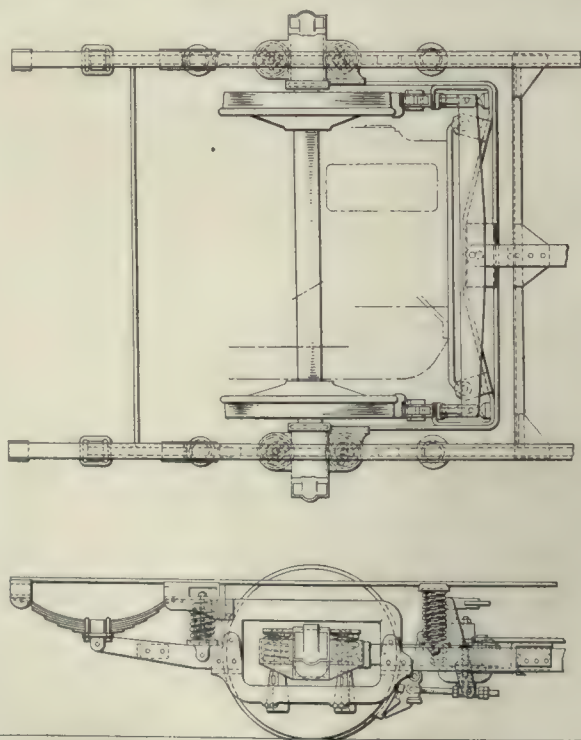
NON-PARALLEL-AXLE TRUCKS

The basic principle of the two most common types of non-parallel-axle trucks involves the use of swinging links which hang from the boxes on diagonally placed pins and which thus compel the boxes to swing in a direction such that when any wheel is forced inward by the pressure of curved track against the wheel flange, the wheel is also moved toward the end of the car, radiating, so to

speak, about a center which is on the center line of the car. Such a movement is brought about by the use of pins at one end of each swing link, the pins for the links of the forward wheels (for a given direction of movement of the car body) being set so that they make the links move only in planes pointing inward, while the pins for the links for the rear wheels are set in such a direction that these



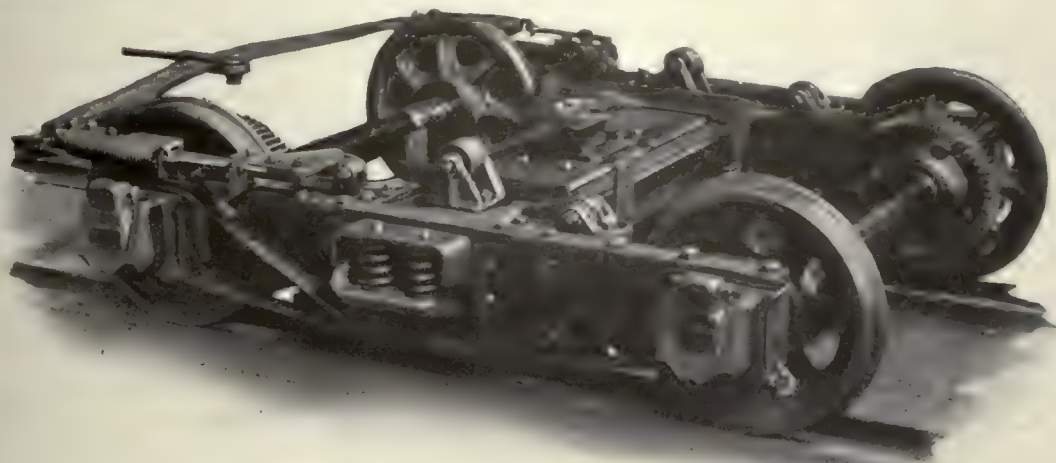
Single-Axle Radial Trucks as Used on Glens Falls Car



Part Plan and Elevation of Non-Parallel-Axle Truck

links swing only in planes diverging from the center line of the car. To be exact, all pins are really on radial lines from the center of axle movement. When one of the forward pair of wheels is forced inward, it also moves ahead, while the outward movement of the opposite wheel involves a corresponding movement to the rear. With the rear pair of wheels (it being understood that the arrangement is symmetrical, and hence is reversible in so far as car movement is concerned) inward pressure causes a rearward movement for the wheel, while the opposite wheel has to move forward. Thus, the two pairs of wheels when subjected to the pressure of the outer rail on a curve, tend to assume positions such that the car is guided around the curve without grinding of flanges.

Provision is made so that the links have a tendency always to return to the vertical, so that the car will ride steadily on tangents. In one case this consists in providing the lower end of each link with two pinions or trunnions, which engage in the



Plain Arch-Bar Truck of Light Weight for Low Floor Cars

yoke braces and are designed so that when the wheels radiate on a curve the trunnion at one side of the lower end of each link leaves its groove, throwing the weight on the other pin and causing the link to return to the normal upright position as soon as a curve is passed and the flange pressure is removed.

Still another type of non-parallel-axle truck for four-wheeled cars has been brought out recently, this differing from the foregoing arrangement in that the two axles under the car are not carried in one structure. Instead, each axle has its separate truck so that, although the arrangement is very commonly known as a radial-axle truck, it might well be distinguished by the term single-axle truck. The two trucks under a car, it is true, are connected by a guide bar, but since this has a spring-controlled sliding sleeve joint, it permits uneven action, which occurs in going over special work or rough track.

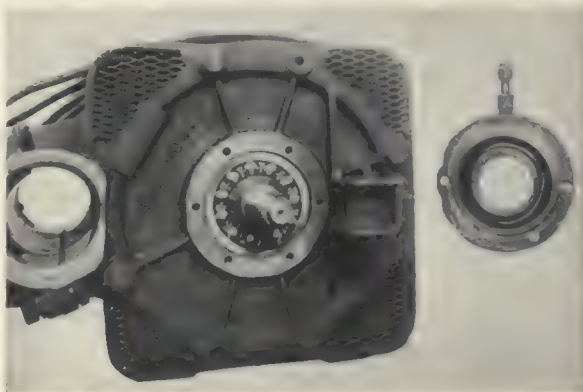
The most radical feature of the arrangement is the use of a pivot bearing at one diagonal corner of each truck, instead of at the center, as is customary. At the other corner of the same side of the truck is a swing hanger, and on the opposite side of the truck both corners are provided with rollers which carry the weight of the car, but which permit the axle to swing radially about the pivot bearing at the other side of the truck. Radiation is effected by pressure of the rail against either one of the wheel flanges. The swing hanger supports a swing link or radius bar that is attached to the car body at one end and is extended horizontally to a pivot under the journal box, this tending to keep the truck in alignment with the rail.

WHEELS FOR ELECTRIC RAILWAY SERVICE

Recent practice in regard to the choice material for wheels under city cars has displayed evidences of a swing back to the use of cast iron in place of solid wrought steel, which was so popular a few years ago, while the revival of the cast-steel wheel

with a manganese tread has been a still more recent development. The steel-tired wheel is now almost universally used for high-speed service, but it has been supplanted in low-speed service by the solid wheel, especially in the regularly rolled sizes, or, say, 36 in. or less, because of the solid wheel's superior simplicity as well as its reduced cost on a mileage basis. Incidentally, it may be said that the one-wear wrought-steel wheel seems to have been very generally supplanted by thick-rim designs, the most economical rim thickness being generally conceded to be $2\frac{1}{2}$ in. This thickness permits two or more turnings to bring the final rim down to the discard limit of 1 in. that is generally used, although frequently a minimum rim thickness of $\frac{3}{4}$ in. is considered to be safe.

Under such circumstances a solid wrought-steel wheel of large size, or, say, 33 in. or 34 in. in diameter, is frequently expected to give a mileage of approximately 200,000 under favorable conditions, the mileage per 1/16 in. of wear being variously assumed between 8000 and 11,000. As compared with this, the mileage of a cast-steel wheel is estimated at between 110,000 and 200,000, while the mileage of a cast-iron wheel seems to be quite well established at about 45,000 miles. The first cost



Standard Railway Motor End-Housing Equipped with Ball Bearings

of the forged steel wheel and the cast-steel wheel are approximately the same, but the scrap value of the forged steel wheel is somewhat greater than in the latter case. The cast-iron wheel, on the other hand, costs less than half as much as the forged steel wheel, and although its scrap value is actually less, the relative importance of the scrap in the case of the cast-iron wheel is greater than in the case of forged steel. Representative weights of wrought-steel, cast-iron and cast-steel wheels, of say 34-in. diameter, are respectively about 650 lb., 550 lb., and 465 lb. In general, when the influence of all these various factors is taken into consideration the net cost per car mile of the three types does not seem to be very greatly different.

Obviously this situation is due to the extremely high mileage credited to the wrought-steel wheel, because both its cost and weight are high, and the high mileage depends absolutely upon the fact that the wheel may be turned two or more times in service. These conditions may have had some influence on the recent revival of popularity for the cast-iron wheel in city service and, in addition to this, there is the fact that some difficulty appears to be experienced in manufacturing wrought-steel wheels in the small sizes that are now so frequently called for on city cars.

The cast-steel wheel, which is made with a tread of high-manganese steel that is chilled and subsequently ground true, has been only recently introduced generally in electric railway service, and mileage records are not available. However, in one case, 30-in. wheels operating under 80,000 lb. capacity motor cars in high-speed interurban service, are reported to be averaging from 175,000 miles to 200,000 miles for their one wear. No definite statistics are available in regard to the percentage of failures before the end of the normal life of this type of wheel, but in the case of service tests under heavy freight cars, a total number of 83,000 wheels in service for an average period of two years and four months, gave a record of sixty-nine wheels removed on account of worn flanges or treads, sixty removed on account of mechanical damage, fifty-six on account of defects in manufacture, and 482 slid-flats, which were removed, reground and returned to service. The feature of this record is the very small percentage of wheels removed for flange wear, this characteristic being reported to have been found in all cases when manganese-steel treads are used.

AXLES AND GEARING

With regard to axles, the most prominent development of recent years is the fact that many of the heat-treated axles that were installed six or eight years ago are now coming to the end of their normal lives, and as a result there have been quite a number of failures. Undoubtedly, the heat-treated ma-

terial, which was introduced solely as a means to make axles carry an increased load without giving them correspondingly increased dimensions to suit the larger motor bearings and greater weights of recent years, is capable of producing steel that will give thoroughly satisfactory results. The fact that heat-treated axles have been found in a great many cases to have a life not necessarily exceeding 200,000 miles and sometimes less, is not necessarily an indication that the use of heat-treated material is undesirable. Apparently the prime necessity is that the steel should be so installed that it will not have to bend in any way, an example of the effect of this being a recent case where electric locomotive axles with reduced centers actually cracked in the middle instead of within the wheel hub, as is almost invariably the case in a locomotive axle failure. This extraordinary location for the cracks has been ascribed to the fact that the heavy loads on the axles produced bending at the middle, and this the heat-treated material was unable to stand. However, heat treatment is a complication, and unless it is properly performed it may not improve the qualities of the axles in any respect. For this reason it has been argued that it is better to make use of annealed steel and to accept the increases in diameter that are necessitated by its use.

During the period covered by this general discussion the changes in gears and pinions for electric railway motors have been mainly those accompanying increased knowledge of the subject gained by past experience. No particular tendencies are in evidence in regard to the use of special classes of material, which include at the present time almost every type of steel. Preference is divided between cast-steel that is case-hardened and tempered and homogeneous forged steel that has been heat-treated to give a hard exterior, grading off gradually to the center of the tooth where the toughness is at a maximum. Untreated steel is used in many cases for gears, but alloy steel does not appear to be popular. Mileages are guaranteed in some instances with gears and pinions that are furnished for particular electric railways, the figures being based upon the life attainable among gears and pinions already in service in the same localities, but it is not considered possible generally to estimate the life that can be attained under ordinary circumstances, since no two companies have the same operating conditions. Gear and pinion mileage is especially influenced by the condition of the track, and where the roadbed is kept free from sand and dust, and the wear on the armature and axle bearings is kept at a minimum, the life of both gears and pinions should reach the highest possible average, assuming that lubrication is carefully attended to. Forged steel, heat-treated pinions, when used with untreated gears, are reported to be giving all the way from

60,000 miles to 175,000 miles. Untreated gears for this combination give from 100,000 miles to 300,000 miles, depending upon the gear ratio and other factors, while heat-treated gears giving a life of 800,000 miles have been reported.

In regard to the design of gears and pinions, it might be said that the split gear fastened by bolts over a key on the shaft has definitely been displaced by the solid gear in all modern construction, the reason being that the solid gear is not only stronger and lighter, but also eliminates the harmful effect of indifferent workmanship during repairs or adjustments. The diametral pitch for gearing has been definitely limited to a maximum of 3, but a figure of 2.5 is very commonly used. Owing to the fact that pinions must have not less than fourteen teeth, while some authorities even advocate a minimum of fifteen in preference, the gear ratio on electric cars with small wheels is limited, and this in turn involves the use of motors having a lower armature speed and consequently higher first cost than would be involved in the case of higher gear ratios. To meet this difficulty there is a growing belief that smaller teeth will have to be used, although this will mean a shorter life for the gearing.

In regard to gear cases, it may be said that steel has been rapidly replacing malleable iron as a material of construction, because of its lighter weight and ability to bend rather than break when the gear case strikes an obstruction in the street. Such steel gear cases are made in various ways, some having each half pressed out complete from a single sheet of metal, and others being pressed in quarters that are hand-riveted and spot-welded along the central seam. The welding process is favored because of its ability to make the gear case absolutely oil tight, and because of the possibility of rivets becoming loose in the thin metal.

MISCELLANEOUS TRUCK FITTINGS

In connection with miscellaneous fittings used in electric railway car trucks, there has appeared a tendency to adopt hardened pieces of alloy steel wherever wear is likely to take place. Case-hardened pins and bushings have been used in a number of cases for the brake rigging and for hangers or other pieces where movement occurs under heavy unit pressures. Bolster chafing plates in some instances are being made of manganese steel, this material being used in preference to case-hardened metal because of the fact that extended wear does not get through the skin and expose soft metal. The same thing applies in the case of motor-nose supports which have been similarly fitted, the motion in this case being almost infinitesimal, although, of course, the unit pressure is heavy.

During the past few years general recognition has been granted to the great importance of having fric-

tion reduced to a minimum at the side bearings, and a number of devices have been brought out to produce this effect. Apparently the most simple of these arrangements are the most popular ones, although some very ingenious schemes have been devised. Ball-bearing center plates have appeared also to a limited extent, and in some cases single balls for the center plates have been used, these giving the ideal condition of universal movement of the center plates with a radius that is reduced to the absolute minimum. The difficulty with such an arrangement is, of course, the greatly reduced bearing area, and here it may be said that opinion seems to be that practically all existing designs of center plates are too small to carry the load properly. This appears in the almost universal tendency of center plates to squeeze out even the heaviest kind of lubricant, so that eventually the center bearings are cut badly and obviously tend to bind. That large bearing areas eliminate this trouble has been demonstrated in practice, some cars even being able to get along with a relatively light oil in the center plate bearings.

The most spectacular development of recent years in connection with truck details has been the introduction of anti-friction bearings in place of plain journals and brasses. These anti-friction devices are of two classes, namely, roller bearings and ball bearings; the former having a theoretical advantage in its ability to carry load, but a weakness in the fact that it has no universally satisfactory means for withstanding end thrust. In practice the roller type of bearing has had an advantage in a cost that usually has been lower than that of the ball bearings, but of late the difference in cost between the two has been approximately equalized. There have been numerous installations of each type of bearing, and although these have been unsatisfactory in some cases (generally owing to an inability of the rolling members to withstand the heavy unit pressures), there have been an ample number of instances to show anti-friction bearings to be really economical provided their life is assured.

The use of ball bearings on motor axle bearings, although it seems more logical than on journal bearings where the loads are heavy, has only recently begun to pass the experimental stage. The reason for this has been that motor manufacturers have not wanted to undertake the use of ball bearings, regardless of the advantages that they might have, until assurance was given that the bearings would be mechanically reliable. Now, however, there has appeared a light-weight railway motor with ball bearings for the armature shaft. In this arrangement the use of ball bearings in place of the customary plain bearings has permitted the motor to be made shorter and generally more compact in its design.



Brakes, Couplers and Other Safety Devices

Prominent recent developments in the now almost invariably-used air brake include, for high-speed service, the universal valve whereby any degree of elaboration in operation may be attained by adding attachments to a single fundamental device, and for city service, emergency valves for plain straight-air equipments. Pneumatic operation also has been utilized frequently for all classes of safety devices such as sanders, fenders, door operating mechanisms and control equipment, the latest development in couplers providing for automatic establishment of air pipe and electrical connections between coupled cars.

SAFETY devices, which naturally occupy an important position in connection with the means for movement of electric railway cars, have had a greatly accelerated development since the comparatively recent establishment of the safety-first movement. In this class of equipment the brake is unquestionably the most prominent, not only because the means for stopping a car are quite as important as the means for moving it, but also because the practically-universal adoption of air-operated brakes has made available on the car a supply of compressed air whose influence on the design of safety equipment has been far-reaching. Pneumatically-operated doors, as previously outlined, are now almost universally used for rapid transit cars and have gained at least a foothold in

city service, and at the same time, air operation has been frequently applied to propulsion-motor control equipment when it has been removed from the platforms. Sanders and even fenders that depend upon compressed air are by no means uncommon, while the latest development in car-coupling equipment makes provision for automatic connection of air hose a feature which originated solely from the universal adoption of the air brake.

AIR BRAKES

With the brake itself, however, the recent changes are improvements only more or less basic in character that have been made from time to time as demanded by service requirements. For city cars the plain straight-air equipment which has been

standard during a number of years has been improved by the addition of an automatic emergency feature, and this has come widely into use, especially in large communities. For high-speed service, where automatic air brakes are essential, the most important development has been the introduction of a so-called "universal equipment" which provides for the extension of operating functions merely by the attachment of additional parts to a fundamental device.

With this universal equipment it is possible to supply the equivalent of the simplest automatic brake in a fundamental form, given an ordinary brake application and an ordinary release. By attaching a special cover to the universal valve, the release of the brake may be graduated, and by adding another portion, greatly increased pressure is obtained in emergency from a supplementary reservoir automatically connected with the brake cylinder at that time. With the operating features mentioned, the universal equipment becomes equivalent in function to the AMM equipment that has been popular for many years in interurban service. Then, if desired, simple flexible straight-air operation (with the automatic feature always in reserve) may be incorporated in the universal valve, straight-air, owing to its convenience, being generally called for at present in service involving operation of both single cars and trains of not more than three cars. When trains longer than three cars are the rule, a quick-action portion may be attached to the universal valve and, similarly, other functions may be added depending upon the needs of the situation.

In subway and elevated rapid-transit service, where load-carrying capacity must be at the maximum and high speeds and short headways are called for, as well as the necessity for the utmost reliability, electric control of pneumatic operation is provided by suitable devices added to the fundamental universal equipment. This permits instantaneous application and release of the brakes throughout the train, as well as other practical advantages making for a higher over-all efficiency and economy in train movement.

In general, it may be said that the universal valve is designed primarily for rapid transit service and for heavy electric traction because it can handle any required size or combination of brake cylinders. Inasmuch as many interurban lines have already standardized upon previously-manufactured types of triple valve, such as that included with the above-mentioned AMM equipment, the universal valve has not come generally into use for electric railway cars having brake cylinders with diameters of 12 in. or less.

Comment might be made here in connection with the electro-pneumatic feature that is provided with

the universal valve in that the positions of the motorman's brake-valve handle are the same for both electric and pneumatic operation. With earlier forms of electric brakes, for example, the position of the brake-valve handle for electric service application was not the same as that for a pneumatic service application, making possible a failure to obtain full braking power unknown to the motorman in case of poor contacts or open circuits in the electric control wires on any car. With the new equipment, potential pneumatic control takes place simultaneously with the action of the electric control, and so long as the electric brake functions properly, the pneumatic brake merely stands ready to act. Therefore, if the electric brake is in perfect order, it controls the train at all times, but if, on the other hand, the electric circuits on any car happen to fail, the only difference appears in the slower operation of the pneumatic control which then operates on that particular car.

In the latest form of this equipment instantaneous action of all brakes in the train is brought about electrically by admitting air direct from the auxiliary reservoir to the brake cylinder on each car of the train, in an amount that is determined by the time during which the controlling magnet valve is energized through the holding of the motorman's brake-valve handle in service-application position. At the same time, because of the position of the brake-valve handle, brake-pipe pressure is also reduced in the usual way, resulting in a readjustment of the internal parts of the universal valve locally on each car and thus placing the pneumatic control in position to function in case of failure of the electric operation. For this electric operation air from the auxiliary reservoir does not pass through the triple valve and, in effect, therefore, the electric service application is similar to that of a straight-air brake.

IMPROVEMENTS IN AIR-BRAKE DETAILS

In connection with high-speed equipment, it is of interest to note that tests made within recent years have exploded the old belief that to keep wheels from sliding at low speed, a blow-down is necessary for heavy emergency pressures in the brake cylinder. In the Pennsylvania Railroad tests it was shown conclusively that the condition of the brake-shoes automatically took care of the tendency toward an increased coefficient of friction at lower speeds, because they heated up sufficiently during the progress of the stop to lose much of their gripping ability. At extremely low speeds, perhaps, this condition might not obtain, but when a train's speed has been brought down to, say, 5 m.p.h., the distance that is run before the full stop is made is so short that the damaging effect of sliding wheels is eliminated. With the modern high-speed brake,

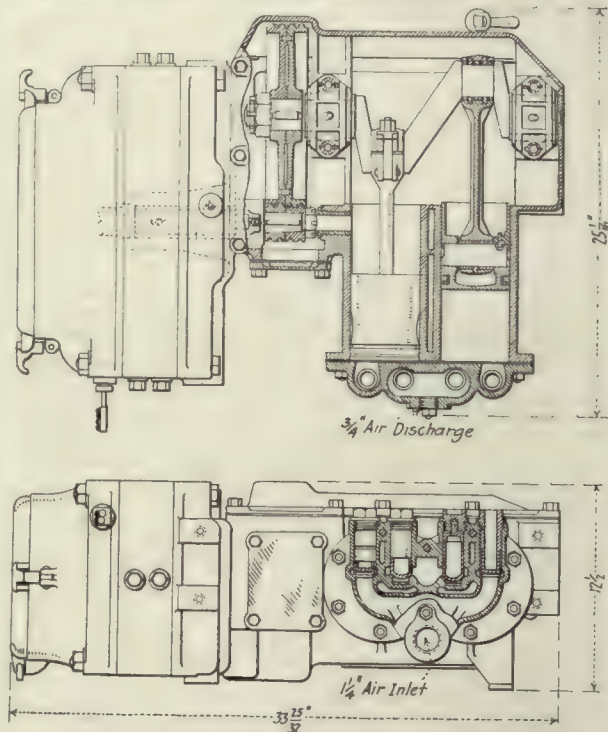
therefore, the blow-down has been eliminated for emergency applications, although emergency pressures at the brakeshoes range from 120 to 180 per cent of the weight on the wheels, depending on the service.

As a consequence of the heavy braking forces necessary to control modern heavy trains, much attention has been given to the clasp type of brake rigging wherein brakeshoes are hung on both sides of each wheel to reduce the unit pressures on the brakeshoes and to prevent the shifting of the journal from under the brass that has been found to accompany high-braking pressures with single shoes. However, the clasp brake has been generally adopted only for cars weighing more than 100,000

cation-and-release pipe, and this moves a valve and opens ports that let main reservoir pressure directly into the brake cylinder. Because of the higher factor of safety over the ordinary straight-air brake and the opportunity to add a conductor's valve and thus put control of the car in the hands of a second man when needed, this emergency equipment is now being installed on a large proportion of modern city cars.

In addition to the above-outlined developments in the air-brake equipment, when considered as a complete system, many improvements have been made in individual devices. One of the most important of these revised designs appears in the air compressor. Here the changes have been along the lines laid down by the modern demand for low floors in city cars, which require the air compressor to be of reduced dimensions to go under the car floor and yet to leave ample room to clear a rough pavement. One such compressor with a weight of 565 lb. has a displacement of 16 cu. ft. per minute at about 200 r. p. m. This capacity is almost universally used with double-truck cars equipped with straight air, while 25 cu. ft. per minute is equally common when automatic brakes are used. Some of the newest one-man cars weighing approximately 10,000 lb. have, however, a compressor of only 5 cu. ft. capacity, the aim being to secure light total weight, but in this case the ratio of compressor capacity to car weight is about the same as it is in the case of the double-truck equipment.

Before leaving the subject of recent developments in air-brake equipment mention should be made of the installation of a successful variable load brake in passenger service, after many years of experiment. In this scheme, the braking pressure is varied in accordance with the load on the car by means of a multi-chambered brake reservoir whose variable volume changes the effective pressure in the brake cylinders, the control being established through electro-pneumatic means, including the use of the car springs as a weighing device. Its possibilities are, naturally, very much greater in electric railway service than on steam railroads because of the relatively greater ratio of passenger load to light weight of car and the better inspection that electric railway cars receive. But for the present, at least, the field for the variable load brake is limited, its particular adaptation being to heavy, high-speed, subway and elevated service where the road's traffic-carrying capacity is limited only by the number of trains that can be operated. Obviously, the ability to brake according to the load and thereby to insure a uniform minimum stopping distance and a minimum headway must contribute materially to increased capacity of the road at congested points.



Air Compressor Designed Especially for Low-Floor Cars

lb., and since shifting of the journals can be avoided much more easily by the use of semicircular journal brasses, it seems doubtful whether the more complicated plan will be used extensively in electric railway service, where the relatively light cars escape the problem of eliminating excessive brake-shoe wear and heating due to high pressures at the contact surfaces.

For low-speed city cars, as previously mentioned, an automatic emergency feature has been developed and added to the plain straight-air brake. This equipment is automatic only in emergency, because such application may be brought about either at the will of the motorman or by the breakage of pipes caused by collisions or otherwise. The emergency action is accomplished by sudden reduction of pressure in the emergency pipe that is installed under the car in addition to the straight-air appli-

Brakes other than air-controlled have appeared in several experimental electric equipments of the solenoid type for city cars. They have appeared also in regenerative brakes that make use of the generator action of the main propulsion motors for heavy electric traction, although this type of brake in its modern form has been applied more frequently to locomotives than to cars, since it was tried and abandoned for general use long since in city service.

BRAKES FOR ULTRA-LIGHT CARS

The recent development of an ultra-light air brake has unquestionably restricted the outlook for the electric brake even on one-man cars, the new type of equipment weighing complete only about 600 lb. In addition, the use of air in this case has the advantage of permitting control of the entrance and exit doors by movements of the brake handle, a feature of no little importance where the motorman's duties are elaborated to the extent of having him collect fares as well as operate the car. With this apparatus the brake valve handle has six positions: release (doors open), release (doors closed), service, lap (doors closed), lap (doors open) and emergency (doors open). The brake valve also embodies a pneumatic sanding feature, whereby sand may be applied to the rail in any position of the handle by the mere pressing down of the handle. The emergency valve operates to apply the brakes, open the front door, lower the steps, unlatch the rear door and blow sand onto the rails should the emergency line be ruptured from any cause or should the operator make an emergency application.

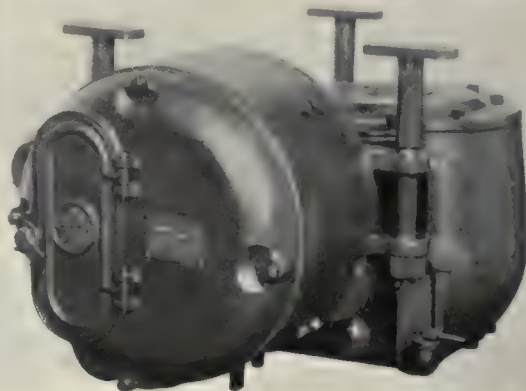
As an adjunct to power-operated brakes of every type, the hand brake has, of course, an absolutely unrestricted field, and in the case of cars ranging in weight up to, say, 25,000 lb., there still remain situations where the hand brake is occasionally used alone. With ultra-light one-man cars, however, the additional duty for the motorman's hands that it imposes has resulted in the installation of air as above mentioned, and even in some cases the use of the foot-operated brake. The latter, however, suffers inherently from a lack of amplitude of movement at the power end, so that hand brakeshoes must be used if sufficient force is to be applied at the wheels. This has not proved to be an altogether satisfactory arrangement on account of the necessity for continual readjustment to maintain the small clearances, and it is probable that the foot brake will never be generally used notwithstanding its convenience in the case of ultra-light cars.

HAND BRAKES

Hand brakes of the vertical staff type have been subject to but few changes from the geared devices with cam-shaped drums that were commonly used a number of years ago, the most important improve-

ment being that sweeping reductions have been made in weight. Modern hand brakes for heavy cars now frequently weigh between 40 lb. and 50 lb. and for light cars actually less than 25 lb. Of late, also, it would appear that staffless brakes have gained materially in popularity, owing to a demand for brakes that will conserve the utmost amount of space on the platform, one of these projecting only 3¼ in. into the vestibule while the distance to the outside of the hand wheel is about 5 in.—roughly half that found with the customary forms of vertical-wheel brakes. With this brake, which weighs about 75 lb. complete, the chain from the brake rod passes under an idler up through the car floor and around a sheave cast integral with a gear that is operated by a pinion on the ratchet-wheel shaft. The gearing is on the order of 4 : 1 so that a 75-lb. force on a 20-in. wheel will provide 2000 lb. pull on the brake rod.

The popularity of the staffless type of hand brake has no doubt been influenced by the fact that the



Three Point Suspension for Air Compressor, Designed to Eliminate Cradle Support

hand brake is becoming more and more of a standby device that is designed for use only when the air brakes fail, and this fact is responsible also for a recent revival of the ratchet brake in the form of a double-acting device with a long handle that is oscillated in a vertical plane, operating a drum such as is used with the staffless type of brake by means of a double pawl and ratchet. The box containing the drum occupies but a small amount of floor space and the fact that nothing but the handle extends above the top of the box makes the device as a whole present a minimum of interference to movement on the platform or in the motorman's compartment where it may be installed. The weight is 67 lb. complete, and the machine is capable of developing a pull of 3000 lb., the double-acting ratchet eliminating all lost motion during application.

No changes of importance have taken place in the design of foundation brake rigging except, perhaps, the revisions that have been necessitated by the introduction of the low-floor car in city service. An

example might be cited in the case of the Pittsburgh low-floor car in which the general arrangement is practically standard in principle. The brake cylinder, which is 8 in. x 12 in., is mounted at an angle with a horizontal, so that the ends of the brake cylinder levers where they make connection with the pull rod are at the highest possible point, just clear of the under side of the floor. The pull rod extends in a straight line to the equalizer bar connection on the truck.

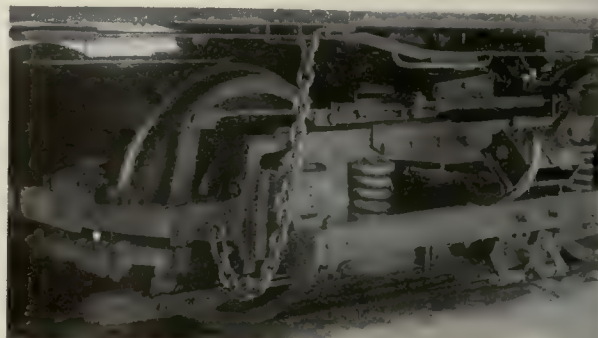
Another development that has been prominent during the past few years has been the introduction of several very satisfactory brake slack adjusters. In one of these devices, when the brakes are applied, the brake beams separate horizontally against the slight friction exerted by a rod that is attached to one beam and slides in a friction sleeve connected to the other. Upon release of the brakes, a small amount of lost motion is first taken up, thus giving clearance for the brakeshoes. As the release continues, the brake beams are held apart by the friction sleeve on the sliding rod, and since the clevis



Non-Automatic and Rotary Types of Slack Adjuster

connecting the live lever with the brake beam is slotted, the live lever slides within this slot and shims that are contained in a box attached to the clevis drop behind the end of a short push rod attached to the lever and moving within the shim box. When the brakes are again applied, the clevis connecting the brake beam to the live lever has been shortened by the total width of the shims that have dropped behind the end of the short push rod, and all clearance is taken out. A non-automatic slack adjuster has also appeared which makes use of shims in about the same manner.

Very much the same principle is applied in the case of another automatic slack adjuster that has recently been brought out except for the fact that, instead of shims that drop behind the end of a rod to shorten the brakeshoe travel, there is used a gripping device on the strut normally separating the bottom ends of the live and dead levers in the truck brake rigging. This, as well as the foregoing devices, are representative of the type of slack adjuster that may be classed as reciprocating as op-



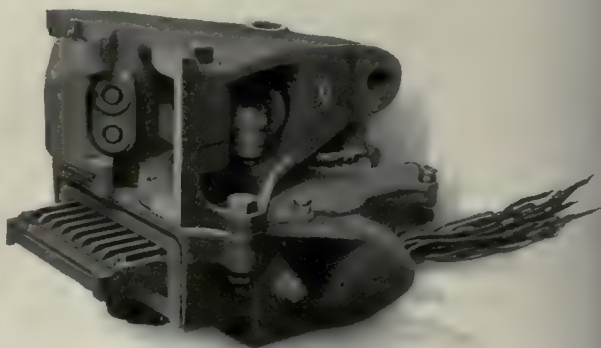
Automatic Shim-Type Slack Adjuster for Outside-Hung Brakes

posed to that which makes use of a screw to attain the same end. Among the latter, one of the most recent forms makes use of a screw and sleeve that takes the place of the usual turnbuckle connecting the lower end of the live and dead levers. At one end of this screw device, there is a simplified friction clutch that is given a motion backward and forward by a bell crank attached to the brake lever whenever the brakes are applied or released, provided that there is excessive motion at the brakeshoes. Although the clutch moves backward and forward, it is bound to slip when the brakes are applied because of the heavy compression then exerted on the screw. But when the brakes are released the clutch is sufficiently strong to turn the rod, screwing it a short way out of the clevis at the opposite end.

Another slack adjuster of the rotating type makes use of air from a port uncovered by excessive air-brake piston travel to operate a simple ratchet, which in turn rotates a screw and changes the position of the cylinder lever fulcrum. The movement is effected by air pressure working against a strong spring, and the latter turns the ratchet only after the brake is released, giving a movement of about 1/30 in. at each operation.

COUPLING DEVICES

The most important recent development in coupler design, whereby provision is made for automatic coupling of connections between cars, includes con-



Automatic Car, Air and Electric Coupler

nections in the coupler heads for two air-brake lines and for any number of control wires as well. All of these connections, of course, are made instantaneously by contact of the two couplers and without necessity for attention by trainmen. Even the operation of uncoupling may be made by air from within the motorman's cab.

In electric railway service, such automatic connectors have been installed only with couplers of the tight-locking type which do not couple with those of the M. C. B. design having vertically hinged knuckles. In consequence, the use of automatic air connectors has found its greatest field for rapid transit service, for city cars that are operated with trailers, and for cars on interurban lines where interchange of traffic is not considered as a possibility. However, it may be said that, by using a connecting device separate from the coupler and flexibly hung below it, automatic coupling of air hose and control wires may be accomplished, and such devices are to-day in use to some extent with steam railroad passenger equipments.

Two types of tight-locking couplers are especially prominent at the present time for electric railway equipment. Both have the distinguishing feature of the type in general which consists in free radial movement in a horizontal plane together with provision to permit several inches of relative movement vertically between the ends of the two coupled



M. C. B. Coupler with Deep-Face Knuckle

cars. In general, the operation of coupling is effected by the action of a wedge or hook against which a lock is forced transversely, and as a result all lost motion is taken up and no opportunity exists for the two coupler faces to work transversely upon one another. The air connections are made by lining up openings in the faces of the couplers that are fitted with rubber gaskets, leakage being prevented by the pressure with which the gaskets are held together. Electrical connections have only recently been installed regularly as a part of automatic couplers, but they have otherwise been added to the plain air-connector equipment both by using a short, hand-inserted cable between the two couplers and by attaching a block containing jumper points and receptacles along each side of the coupler face.

In general, the tight-lock type of coupler appears to be much more popular in electric railway service than the M. C. B. type because of its simplicity, lightness and convenience. However, where there is an exchange of traffic with steam roads or where such an exchange may be a future possibility, the M. C. B. type with a knuckle operating in a vertical plane is absolutely necessary. In such cases, however, a different arrangement of draft rigging to that which has become standard on steam railroads has had to be adopted on account of the sharp curves and sudden changes of grade common on many electric railway lines. This arrangement provides for free radial motion from the drawbar anchorage which is several feet back of the coupler face, and it is not uncommon for the



Tight-Lock Type Coupler with Air Connections on Suburban Car

couplers to swing through arcs approximating 80 deg. from the center line of the car as trains pass over curves. To provide for vertical curves or sudden changes in the vertical alignment of the rail, two plans have come into general use. One of these makes provision for anchoring the coupler shank at some little distance below the bottom of the bumper framing and supporting the outer end in a spring carrier that permits vertical movement as well as horizontal radiation. As an alternative to this appears the plan of holding the coupler shank permanently in a horizontal plane and extending the knuckle vertically so that ample vertical motion is provided for without danger of the couplers becoming separated, and following out this idea several interurban railways have adopted knuckles that are 13 in. deep.

SANDERS, FENDERS AND WHEEL GUARDS

The track sander is another item of car equipment in whose recent development appears the influence of the presence of compressed air upon the car, pneumatic sanding devices having come into use to a considerable extent within recent years although, of course, they by no means dominate the field. In general, their popularity depends upon their ability to throw sand under the wheels where it is needed as well as their elimination of sand valves whose moving parts are frequently a source of trouble. Nevertheless the moving gate of the gravity-operated sand box has one very definite advantage in that it simplifies the introduction of agitation to break up caked sand when the gate is opened, a comparatively recent development carrying the principle of sand agitation to the logical extreme of having a rotary sand drum with a pick-up arrangement like an inverted water wheel at one end. This delivers a definite quantity of sand to the discharge pipe whenever it is rotated by pressure on a pedal in the vestibule floor.

Popular types of sanding equipment that have been more or less recently developed include a vacuum sander that differs from the common compressed air form in that it is designed to draw the sand from the supply receptacle by means of the vacuum created by the expansion of compressed air discharged from a nozzle at the outlet chamber. Since the sand is not moved directly by contact with the air jet there is avoided the possibility of introduction of moisture from the compressed air into the sand. Instead, dry air is drawn from the inside of the car body through the sand and this assists in keeping the sand dry. The feature of another pneumatic sanding device is the use of a valve so located that it becomes possible for the motorman to apply sand at any time without removing his hand from the brake-valve handle, beneath which the sander-valve handle is mounted.

The attachment of sander pipes to the truck frame in such a position that they will deliver sand to the rail even on curves has become common. A recently developed device along these lines has been brought out in the form of a telescoping spout of steel tubing, this being fastened at the upper end to the body of the car. The lower end which includes a short length of flexible steel tube is attached to the truck, so that the discharge nozzle retains a position directly in front of the wheel regardless of its position relative to the car body.

Either fenders or wheel guards in some form are included as a part of the safety equipment for almost all modern city cars, especially in the larger communities. For interurban service, however, the slow speed at which runs through city streets are made, as well as the danger of hanging such equipment at the front end when speeds are high, practically prevents its use, and the pilot, as a rule, is the only device of the kind that is found on high-speed cars except in isolated cases.

For city service there is a division of opinion as to the relative merits of fenders and wheel guards. Of a number of representative cities in the United States and Canada, four have fenders only, four have both fenders and wheel guards, and five have wheel guards only, including three which recently replaced fenders with wheel guards. In European cities the question of equipping street cars with safety devices has apparently been satisfactorily solved by the abandonment of the protruding fender and the general adoption of automatic wheel guards. In this country, however, the situation is complicated by the irregular and uneven surfaces of highways, accumulations of snow and ice for extended periods of time, and climatic changes which frequently result in the upheaval of paving blocks. This handicaps the wheel guard which, in addition, does not protect against impact with the bumper, and yet extensions beyond the car end like the fender may even introduce an element of danger.

At the present time an almost infinite variety of devices are being installed in new cars. However, a clear majority appears in favor of the type of wheel guard that is operated automatically by a simple trip actuated by a vertical apron hung under the dash, a backward movement of the apron causing the wheel guard to drop upon the rail, while resetting is provided for by a crank connected to a pedal extending through the vestibule floor. Next in popularity to this type of apparatus, as shown by the record of recent construction, comes the home-made fender which appears in various forms, although it generally involves the simplest kind of construction wherein there is only an extending apron supported by light chains extending back to the dash and without means for automatic operation.



Modern Railway Motor Design and Methods of Construction

The use of interpoles and ventilation, which appear in practically all recent designs for railway motors, has made practicable the reduction in dimensions characteristic of modern low-floor car equipments, and has decreased modern motor weights by about 30 per cent. Field control motors also have come into service to a considerable extent and have effected appreciable economies in energy consumption, while improved insulation now permits hotter working and has thus materially increased nominal ratings.

THE development of the modern railway motor has, perhaps, extended over a greater period of time than that which has obtained in the case of the other features of modern electric railway car equipment. However, the improvements that have become common in recent designs have been so marked that in some instances they have actually brought about the displacement of propulsion equipment which has been in perfectly operable condition aside from a lack of the high efficiency attained by the modern apparatus. Recent motors have been very generally provided with interpoles and ventilation and in some cases with field control, and these improvements in turn have permitted the compact lightweight construction essential to the modern, low-floor car designs. As an aid to this there have been important but less spectacular improvements in details, and, in

addition, experience has brought about many minor changes in construction and insulation which have exercised an important influence on durability and reliability of operation.

INTERPOLE MOTORS

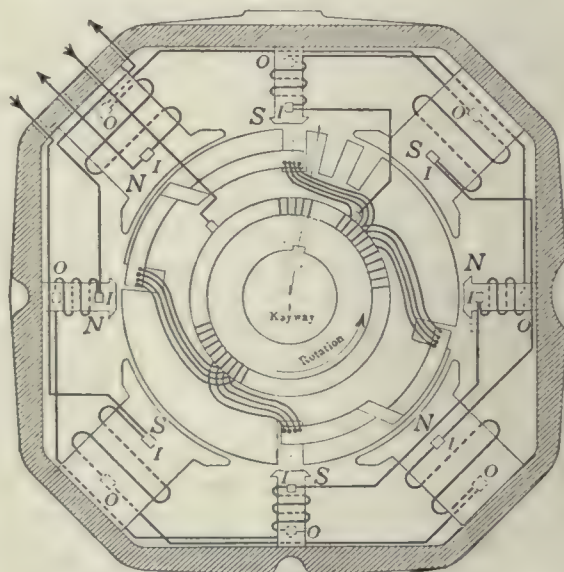
Of the various improvements which have marked the progress of railway motor design, the interpole, or commutating pole, introduced about 1907, is probably the most important. Certainly no other improvement has ever led to such far-reaching results. At the time of the introduction of the interpole motor the straight series motor had practically reached a standstill in so far as development was concerned, and, with the increased demands of service, the limitations of existing motive power were beginning to be felt. The new type of motor offered so many advantages over the older

one that, particularly during the last five years, there has been a marked increase in its use, all of the newer designs being of the interpole type, while some operating companies have even built interpoles into their old motors.

The principle of the interpole is based on the fact that in any dynamo machine of the commutator type, the current in a coil undergoing commutation must not only be brought to zero value, but must also be reversed and brought up to full value in the opposite direction. If this is not done the tip of the brush as it leaves the commutator segment to which the coil is attached will be carrying current, and because of the interruption of this current, will cause a tiny arc. Briefly stated, it is the function of the interpole to provide means for reversing the coil current and building it up in the opposite direction, and thus to eliminate sparking at the brushes.

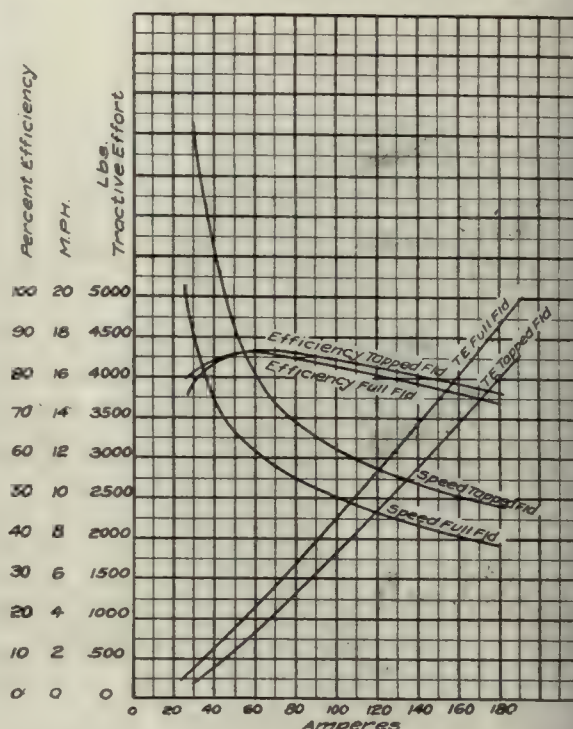
The interpole, which is a small pole placed between the main or exciting poles of a motor, is usually constructed of a solid piece of soft steel wound with a few turns of wire in series with the armature. If the strength of the interpole field was always directly proportional to the armature current, sparkless commutation could be expected for all loads, provided the motor ran at constant speed. But inter-pole field strength is not directly proportional for all loads, and further, the speed of a railway motor varies between wide limits; yet, even with these limitations, currents of from two to three times the rating may be commutated sparklessly.

Interpoles make possible a reduction in the air gap, with a consequent reduction in the weight of the whole motor, and raise the limiting voltage between segments to a considerably higher value, thus making possible the design of motors for operation on higher voltages. Further, the in-



Wiring Diagram of Typical Interpole Motor

Gear 71 Teeth Pinion 15 Teeth Reduction 4.73
Wheels 32"



Characteristic Curves of Typical Field-Control Motor

ductance of the interpole windings tends to reduce the number of flash-overs by limiting the flow of surge currents.

Besides the partial removal of the important design limitations just noted, the practical elimination of sparking has resulted in many operating advantages. The short-time ratings of motors have been materially raised, thus permitting the use of higher rates of acceleration. More rapid acceleration in turn results in decreased energy consumption and in many cases in decreased motor heating. Commutator maintenance costs are also decreased, as reflected by the fact that the sale of replacement commutators by manufacturers has practically ceased since the general introduction of interpole motors. In addition, brush life has been increased about 50 per cent on the average as the result of the decreased flashing and sparking, and the accompanying decrease in commutator losses has reduced motor heating to some extent.

Briefly summarized, the introduction of the interpole has made available to railway operators a lighter, cheaper, more reliable type of motor. At the same time, the partial removal of important limitations in design has made possible the development of successful new types of high-speed, high-voltage and field-control motors.

Control of motor speed by varying the strength of the motor fields was practised on some of the earliest railway motors but was discarded because of the poor commutation secured when a motor

was running with weakened field. Its reintroduction in connection with motors for street railway service about five years ago was largely due to the fact that the interpole had practically solved the commutation problem, although, of course, the general progress in the art of motor design and the better understanding of the principles of motor application had something to do with this.

FIELD-CONTROL MOTORS

Field control motors had been successfully used for locomotives prior to 1911, but it was not until that date that they were given a thorough try-out on electric railway cars, and that their application to this service has been a successful one is to be inferred from the fact that some fifty operating companies now have in operation motors of this type with an aggregate rating of nearly 850,000 hp. In general, the adoption of field control adds to the first cost of motor equipments, but this appears to be offset by the numerous consequent advantages.

On some equipments the connections are so arranged that the use of the weak field is possible only when the motors are connected in parallel. There is, however, an increasing

tendency to use field control on both the series and parallel connections of the motors, and when this is done there is considerable flexibility in the matter of motor speed, because four economical controller settings are possible. The change from full field to short field ordinarily secures a speed increase of from 10 per cent to 30 per cent, depending upon the design of the motor.

Speed and tractive effort curves of a field-control motor are here given for both the full field and the normal field conditions, and from these it will be noted that the full-field characteristics indicate high tractive effort and low speed as compared with the normal field characteristics. Equipping a car with field-control motors, therefore, provides the car with means of accelerating rapidly, and with a minimum amount of loss in the starting rheostats, as well as with means for maintaining a high-running speed.

In interurban work the speed flexibility of the field-control motor is of value because it permits the use of the same equipment for both local and limited work. Also, because of the low speed that can be secured with the motors in series on the full field connection, more economical operation on city streets is possible. Further, the starting current peaks are usually from 10 per cent to 20 per cent lower than those produced by non-field-control equipment, and, as these peaks usually decide the substation capacities on an interurban road, this advantage is one of importance.

MOTOR VENTILATION

During the past five years special attention has been paid by designers of electrical machinery in general to the subject of ventilation and the flow of heat through the materials used in the construction of such apparatus.

In fact, next to the interpole, the introduction of modern ventilating methods has constituted the most important step in advance in the art of railway motor design made during the last decade.

Modern motors are being ventilated either by the forced ventilation or by the self-ventilation system. With forced



Storage-Battery Car of New York Railways Operated by Two $7\frac{1}{2}$ -Hp. Motors

ventilation, air from an auxiliary fan is blown through the air passages of the motors, the flow of air being independent of the motor speed and susceptible of some adjustment, and by sufficiently increasing the flow of air overloads can be carried for a considerable period of time, the increase in continuous motor rating ranging from 50 per cent to 250 per cent. Forced ventilation is the most effective of all methods of motor cooling, but the auxiliary apparatus that is required limits its use to locomotives and to extremely heavy cars. Self-ventilation is, therefore, the system that is of major interest in connection with motors for ordinary electric railway service.

A number of different forms of self-ventilated motors have been developed. In the armature-ventilated type, external air is circulated through the armature only, the air entering the casing through inlet openings at the commutator end and

passing in turn through longitudinal ducts in the commutator and armature, the fan and the exit opening at the pinion end. In the field-ventilated type the air is passed over the outside of the armature along the air gap and through the spaces between the field coils. Obviously the best results cannot be obtained by the use of either of these methods, but they increase the continuous rating of the motor from 10 per cent to 35 per cent over the unventilated rating.

With the more recent series-ventilated fan-type motor an effort has been made to force cooling air into intimate contact with all of the heated parts. In this type outside air is circulated in succession through the inter-field spaces, the armature coils and the commutator, a suitable inlet being provided on top of the motor at the pinion end and an outlet at the side or bottom of the casing at the same end. In order that the air striking the windings may be as dry and clean as possible under the conditions set by operation, some of the more recent motors using series ventilation have the direction of air flow reversed from that just described, the outside air coming in contact with the longitudinal ducts in the commutator and armature before it strikes the windings. The increase in motor rating with this system of ventilation is from 25 per cent to 35 per cent in sizes up to 55 kw. and from 35 per cent to 80 per cent in larger sizes.

The parallel-ventilated type is another recent introduction. Motors using this type of ventilation are provided with a double fan mounted on the pinion end of the armature shaft. Air is drawn in through ducts at the commutator end, passes in two parallel streams, one through the inter-field spaces and the other through the armature and then through the fan and carefully designed passages in the motor casing to the outside. This is a very effective method of ventilation, the increase in continuous rating ranging from 30 per cent to 70 per cent for the smaller motor size and from 40 per cent to 100 per cent for the larger sizes. However, the system requires a large fan, and in cases where space limits the fan diameter the ventilation is apt to be ineffective.

In the compound type of ventilation external air is circulated by a double fan along two routes, one similar to that followed by the air in the straight series-ventilated type and the other similar to that in the field-ventilated type. This plan seems to combine to a certain extent the advantages of both the series and parallel schemes and eliminates some of their disadvantages, giving about the same increase in continuous rating as the parallel system of ventilation.

Ventilation does not greatly affect the short-time rating of a motor, because such ratings are

more affected by the heat-absorbing ability of the motor than by its heat-radiating ability. The most important advantage of ventilation comes in its increase of continuous rating, or, to put it in another way, the reduction of motor size required to handle a given service.

Since the amount of air circulated in a self-ventilated motor depends upon the speed of the fan, it is evident that in a service where low motor speeds (not necessarily low car speeds) are involved, no great weight reduction can be gained by the use of a self-ventilated motor. Obviously, the best results with any self-ventilated motor can be gained in a high-speed service involving few stops. This does not mean that the use of ventilated motors for city service is not accompanied by a reduction in weight of equipment, but it does mean that if a material reduction in weight is to be secured the matter of gear ratio must receive careful attention. The point is that it is motor speed and not car speed which affects the efficacy of the fan. In this connection, the influence of abnormal voltage is of interest. In continuous service, motor operation on reduced voltage means a low fan speed, and, therefore, poor ventilation. On the other hand, voltages above normal result in a high-fan speed so that a ventilated motor may run cooler than on its rated voltage. Whether or not it will do so depends, of course, upon the relative importance of the copper and iron losses of the motor.

In actual service, even an inclosed motor receives considerable benefit from the movement of the car through the air, and hence the advantages gained by the use of ventilated motors are not as marked as might be expected from a comparison of the increased motor ratings as mentioned above. Also, it is worth while to note, that because of its lighter weight the ventilated motor may have a lower thermal capacity, and therefore a lower short-time overload capacity than the non-ventilated motor.

One would naturally expect that dust and weather conditions would seriously affect the operation of the ventilated type of motor. But experience has shown that dust does not accumulate in the air passages to the extent that it was expected to, and that if the passages are blown out occasionally with compressed air no serious reduction of motor capacity will occur. It is important, however, that the motor receive some such attention occasionally. As far as moisture is concerned, it seems that ventilated motors are fully as reliable as non-ventilated motors. A consensus of the opinions of those who have had considerable experience in the operation of ventilated motors seems to be that, in most services, ventilation results in a perceptible decrease in weight, a decrease in cost amounting, in some instances, to 25 per cent, a more uni-

form temperature throughout the motor, a lower maintenance cost due to the elimination of hot spots, and a decrease in the tendency to spark or flash over because of the removal of the copper and carbon dust and of the hot metallic vapors produced by sparking and incipient flashes.

MOTOR DETAILS

Although improvements in construction details have not been quite so widely heralded as some of the important innovations already described, many such changes have been made within the last few years. Designers have attempted to utilize the materials of motor construction to better advantage and to develop a "foolproof" and highly reliable type of motor.

In the matter of motor frames, there has been an increasing tendency toward the use of the box construction. In fact, reports of motor sales seem to indicate that approximately 80 per cent of the motors sold during the last few years are of this type. One of the objections which has often been urged against this form of construction is that, in order to change an armature, particularly one of the larger sizes, it is necessary to remove the truck from under the car. Thus, the operation requires more time and more elaborate equipment than would be required to effect a similar change in a split-frame motor. In the opinion of some operating men, however, this is not an objectionable feature since the removal of the truck enables the men to work to better advantage and at the same time brings to light any truck and wiring defects. Further, with the development of new shop methods, it is found that repairs on box-type motors can be executed just as rapidly as on motors of the split-frame type.

The advantages usually given for the box frame as compared with the split frame are the greater output for a given weight and space, the greater structural strength and durability, a better support for the gear case, an unbroken magnetic circuit, more space for the passage of cooling air around the field coils and the elimination of exposed field coil connections.

As far as fundamental principles are concerned no marked improvements in devices for lubricating motor bearings have been made since the introduction of the oil-lubricated bearings nearly fifteen years ago. Until recently it was the practice to operate street railway motors with no protection for the ends of the motor shaft bearings and the axles. Thus dirt entering the bearings formed a grinding compound which naturally increased bearing wear. Now, however, caps are provided for the ends of motor shafts, and a sleeve extending between the inner ends of the two axle bearings is used to protect the axle from dirt. The results obtained from

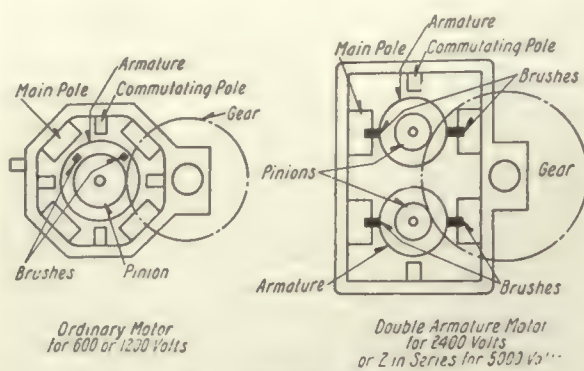
the use of the axle sleeve have been so favorable that many operating companies are equipping their old motors with sleeves as fast as the motors come into the shop for repairs.

Experience with the operation of the older types of motors has indicated that electrical troubles are often caused by mechanical defects. For instance, armature insulation not infrequently has broken down as a result of abrasion caused by the relative movement of windings and core. In the newer motors vibration of the individual core disks is eliminated by assembling them under hydraulic pressure either on the armature shaft itself or on a spider which in turn is pressed onto the shaft. Also, the construction is such as to permit the removal of the shaft without deranging the windings in any way. In order to insure that the armature coils are permanently tight in the slots it is now common practice to band the armatures while they are hot.

The bolted construction is still the only safe method of holding large commutators together, but the methods of manufacturing mica V-rings and of ageing commutators under heat have improved to such an extent that the ring-nut construction for small and medium size armatures is considered as safe as the bolted construction. The practice of undercutting the mica between segments which has been followed for the last few years has materially lessened commutator troubles and has greatly increased the reliability of the motor. Experience has shown that, where good brushes are used, it is not necessary to undercut the mica to the extent that was formerly considered essential.

Apparently the progress in brush manufacture has kept pace with that in the other details of motor manufacture, as the average modern brush is vastly superior to the average brush of ten years ago, especially in uniformity of composition. Small irregularities in the commutator should not cause chattering of the brushes. In order to prevent it the masses that are moved up and down with the brush must be kept small. This fact has been given careful consideration in the design of modern brush-holders, and further to minimize vibration a frictionless vibration spring is usually included between the brush rigging and the hammer which holds the brush in position. This permits the brush to move slightly without moving the rigging. In general, modern brush-holders have been marked by simplicity in design and ruggedness of construction.

Recent improvements in methods and materials for coil insulation have been truly remarkable. Formerly the heat limits of a motor were determined absolutely by the ability of the cotton insulation to withstand heat. Now the limit seems to be either that of the dielectric strength of the insulation itself



Comparison of Standard and High-Voltage
Twin-Armature Motors

or that of the melting point of the solder which is used to attach the coil leads to the commutator. The use of asbestos tape, mica and the various fire-proof, heatproof and moistureproof compounds used in impregnating cotton insulation and in mummifying the coils has made the modern armature as durable at 100 deg. Cent. as its predecessor was at 55 deg. Cent. The mummifying process, by eliminating air pockets, has materially increased the heat-conducting power of insulation. In addition, the use of modern insulations and strap or bar windings has improved the space factor of the armature slots and increased the output for a given size of armature, while the introduction of U-shaped pieces of slot insulation has cut down the number of coil break-downs. Mummified strap-wound field coils are being used almost universally. The insulation between the various coil layers is usually of mica disks. In bringing out the field coil connections it is considered good practice to attach the connecting cables permanently to a strap inside of the coil with a well-soldered joint and to connect the outside cables together with a rugged joint of the sleeve type.

MOTOR CAPACITY FOR RAILWAY CARS

With regard to railway motors in general it may be said that the experiences and studies of earlier years have given engineers a better understanding of the principles of motor application and of the qualities of materials, and consequently a more accurate predetermination of the equipment suit-

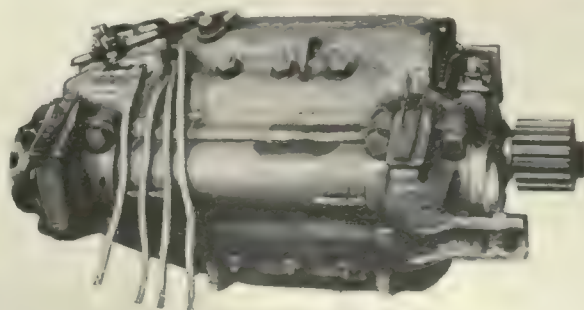
able for given service is now possible than was formerly the case. In the latest standards of the American Institute of Electrical Engineers the continuous rating for railway motors is required to be specified in addition to the older one-hour rating, the modern ratings being expressed in kilowatts instead of horsepower.

That there is still room for improvement in some of the methods of selecting motors now in use, however, seems to be evident from the accompanying Table VII. In this a number of modern cars have been grouped into several classes on the basis of the nature of service. A study of the figures in the column headed "Kw. per Ton" indicates that there is a considerable variation in the factor among the various companies. Differences in schedule speed, number of stops per mile, grade and other local conditions will account for part of the variations, but it hardly seems that all of the differences can be covered by these factors.

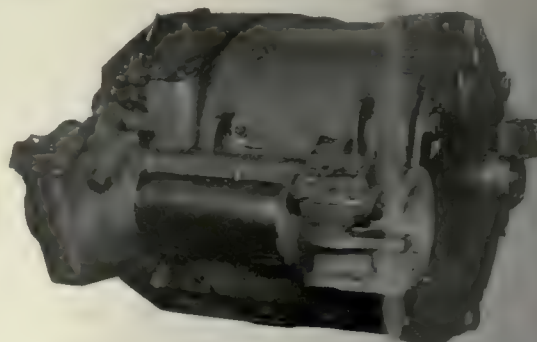
RECENT MOTOR TYPES

Among the recent interesting designs may be mentioned those which have been developed for the popular low-floor type of car in which severe space limitations are set by the small wheels. Data covering the motor which was originally built for the Pittsburgh low-floor car, and which has been used widely in other cars of similar design, are shown in Table VIII, and a comparison of its main dimensions with that of an old-style, non-ventilated, non-interpole motor of the same one-hour rating is included. It will be noted that the new motor is 270 lb., or 13.5 per cent, lighter than the old one. The comparison is made on the basis of the same one-hour rating, and as the new motor is well ventilated its service capacity is much greater than that of the old motor. A comparison of weight based on service capacity, therefore, would show up much better for the new motor.

The recent demand for small ultra-lightweight cars has brought with it a demand for a very small motor. As a result, motors with ratings as low as 13.1 kw. (17½ hp.) are now on the market. Standard automobile motors are used in some very light cars.



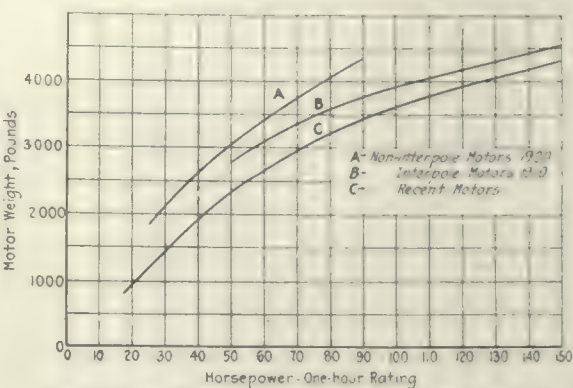
Original Low-Floor Motor



Repulsion-Type A. C. Motor for Navy Service

Of late the range of voltages for which direct-current motors can be constructed has been greatly increased. For new interurban roads, voltages ranging from 1200 to 2400 are being adopted, and on an experimental road a contact line pressure of 5000 volts is being tried out. Of course, these high contact-line pressures involve motor designs using as much as 1250 volts across a single commutator. The motors for the 5000-volt line are of special interest in that their construction makes use of the twin armature idea. This eliminates the difficulty of wheel slipping involved when armatures on different axles are connected in series to cut down the voltage across each one.

In the field of alternating-current railway motors the only important innovation has been that made by the Pennsylvania Railroad in its recent electrification of some of the suburban lines in Philadelphia. This motor is of the so-called repulsion type and has a one-hour rating of 225 hp. and a continuous rating of 200 hp. when ventilated with 1200 cu. ft. of air per minute. In this case the repulsion scheme, as originally developed by Prof. Elihu Thomson is modified by the addition of a series connection of the armature and field windings. These windings are therefore, both "conductively" and "inductively" connected. To the extent that current is induced in the short-circuit armature because of the transformer effect of the auxiliary winding it is a repulsion motor. On account of



Weight Comparison of Old and New Railway Motors

the low resistance of the armature short-circuit, the induced current during the starting period has a high value. It may be well to state here, however, that these motors are still in the process of development, and must still stand the test of hard service over an extended period of time.

To show the general advance that has been made in the way of weight reduction in direct-current motor design the accompanying curves have been plotted. The points through which the curves were drawn were, of course, more or less scattered, but it is believed that the curves represent a fair average. The cycle through which small motor sizes has passed is indicated by the locations of the left-hand termini of the curves. The average weight of a modern 37½-kw. (50 hp.) motor is about 2300 lb. Using it as a basis of comparison the average interpole motor of the same horsepower rating in 1910 was 21 per cent heavier and the average non-interpole motor of 1900 was 32 per cent heavier.

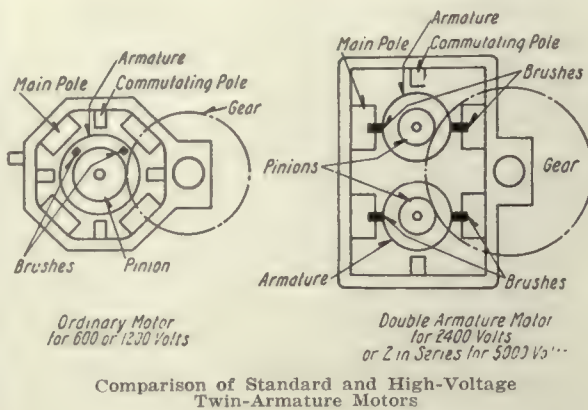
Briefly summarized, as a result of recent progress the limits set by commutation, motor heating, speed and voltage, which fix motor capacity, have been greatly extended. The weight of a motor for a given service has on the average been reduced in the neighborhood of 30 per cent. The reliability of the motor has been increased, as published reports indicate that for modern motors the inspection cost is from 50 to 75 per cent and the maintenance cost 25 per cent of that of the old types. Thus the economies obtained with modern type motors are sufficient, in some services, to justify the replacement of many old motors which are still in good operating condition.

TABLE VII—MOTOR POWER AND CAR WEIGHTS				
Kind of car	Name and location of road	Car weight tons (empty)	Number of motors	Kilo-watts per car
Modern ultra-light weight cars	Puget Sound Type Car	5	2	27.0
	Tucson, Ariz.	5.5	4	21.0
	Corpus Christi, Tex.	7	2	26.3
	Albuquerque, N. M.	5.9	2	26.3
	New York City	6.1	2	12.0
	Average (first four)			4.3
Modern single truck cars	Union R.R. N. Y.	12	2	64.5
	Bangor, Me.	13	2	60.0
	Albany, N. Y.	11	2	60.0
	Marshall, Tex.	11.9	2	75.0
	Average			5.4
Light-weight, double-truck cars for city service	Wilmington & Philadelphia	15.2	4	75.0
	Buffalo, N. Y.	15.9	2	52.5
	Rochester, N. Y.	15.9	2	52.5
	Des Moines, Ia.	16.5	4	105.0
	San Francisco	17.1	4	105.0
	New Orleans	17.8	2	97.5
	Chicago	17.7	2	90.0
	Pittsburgh	17.8	4	105.0
	New York	18.0	2	75.0
	Average			5.0
Interurban cars	K.C. & St. J.	40.5	4	375
	U. T. & Ind.	42.8	4	330
	Chi. & N.	44.6	4	420
	Cleveland	29.7	4	105
	Cleveland	28.1	4	150
	Tol., Peck & Findlay	34.0	4	225
	Annapolis Line	40.1	4	225
	Wash. & A.	29.0	4	150
	Average			7.0
Rapid transit cars	Chi. El.	35.2	2	240
	N. Y. M.	42.5	2	240
	Boston	42.9	2	300
	Interboro R. T.	38.9	2	300
	Average			6.8

¹Automobile motors.
²Storage battery car.

TABLE VIII—COMPARISON OF LOW-FLOOR AND OLD-STYLE MOTORS

Motor	Low Floor Type	Old-Style Standard
Rating:		
600 volts	35 hp.	35 hp.
500 volts	30 hp.	30 hp.
Clearance, underneath:		
30-in. wheels	3 1/4 in.	4 1/2 in.
Speed (500 v. 58 amperes)	605 r.p.m.	610 r.p.m.
Diameter of armature	10 1/2 in.	11 1/2 in.
Number of slots	27	30
Turns per coil	3	3
Length of commutator	2 1/4 in.	3 in.
Thickness of shell	1 1/4 in.-1 1/2 in.	1 1/2 in.-1 3/4 in.
Diameter of armature shaft	2 1/4 in.	2 1/2 in.
Weight with gears and case	1750 lb.	2020 lb.



or that of the melting point of the solder which is used to attach the coil leads to the commutator. The use of asbestos tape, mica and the various fire-proof, heatproof and moistureproof compounds used in impregnating cotton insulation and in mummifying the coils has made the modern armature as durable at 100 deg. Cent. as its predecessor was at 55 deg. Cent. The mummifying process, by eliminating air pockets, has materially increased the heat-conducting power of insulation. In addition, the use of modern insulations and strap or bar windings has improved the space factor of the armature slots and increased the output for a given size of armature, while the introduction of U-shaped pieces of slot insulation has cut down the number of coil break-downs. Mummified strap-wound field coils are being used almost universally. The insulation between the various coil layers is usually of mica disks. In bringing out the field coil connections it is considered good practice to attach the connecting cables permanently to a strap inside of the coil with a well-soldered joint and to connect the outside cables together with a rugged joint of the sleeve type.

MOTOR CAPACITY FOR RAILWAY CARS

With regard to railway motors in general it may be said that the experiences and studies of earlier years have given engineers a better understanding of the principles of motor application and of the qualities of materials, and consequently a more accurate predetermination of the equipment suit-

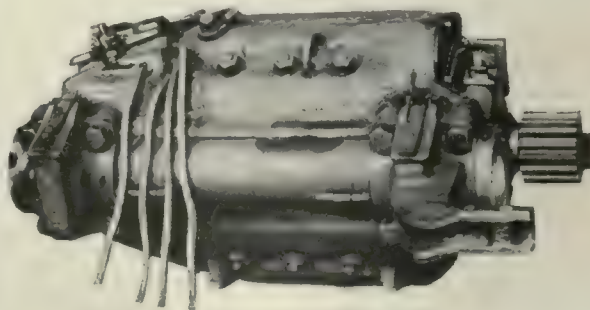
able for given service is now possible than was formerly the case. In the latest standards of the American Institute of Electrical Engineers the continuous rating for railway motors is required to be specified in addition to the older one-hour rating, the modern ratings being expressed in kilowatts instead of horsepower.

That there is still room for improvement in some of the methods of selecting motors now in use, however, seems to be evident from the accompanying Table VII. In this a number of modern cars have been grouped into several classes on the basis of the nature of service. A study of the figures in the column headed "Kw. per Ton" indicates that there is a considerable variation in this factor among the various companies. Differences in schedule speed, number of stops per mile, grade and other local conditions will account for part of the variations, but it hardly seems that all of the differences can be covered by these factors.

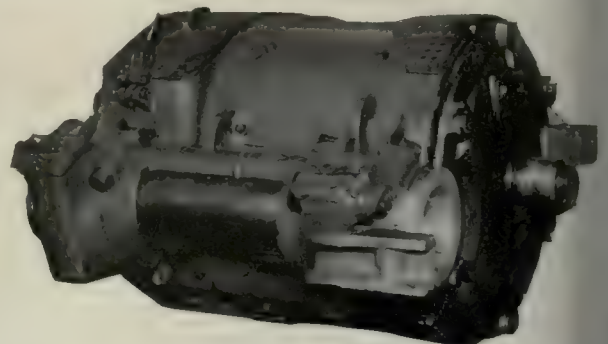
RECENT MOTOR TYPES

Among the recent interesting designs may be mentioned those which have been developed for the popular low-floor type of car in which severe space limitations are set by the small wheels. Data covering the motor which was originally built for the Pittsburgh low-floor car, and which has been used widely in other cars of similar design, are shown in Table VIII, and a comparison of its main dimensions with that of an old-style, non-ventilated, non-interpole motor of the same one-hour rating is included. It will be noted that the new motor is 270 lb., or 13.5 per cent, lighter than the old one. The comparison is made on the basis of the same one-hour rating, and as the new motor is well ventilated its service capacity is much greater than that of the old motor. A comparison of weight based on service capacity, therefore, would show up much better for the new motor.

The recent demand for small ultra-lightweight cars has brought with it a demand for a very small motor. As a result, motors with ratings as low as 13.1 kw. (17½ hp.) are now on the market. Standard automobile motors are used on some very light cars.



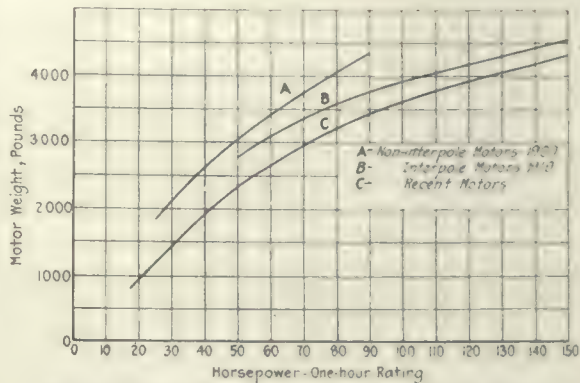
Original Low-Floor Motor



Repulsion-Type A. C. Motor for Heavy Service

Of late the range of voltages for which direct-current motors can be constructed has been greatly increased. For new interurban roads, voltages ranging from 1200 to 2400 are being adopted, and on an experimental road a contact line pressure of 5000 volts is being tried out. Of course, these high contact-line pressures involve motor designs using as much as 1250 volts across a single commutator. The motors for the 5000-volt line are of special interest in that their construction makes use of the twin armature idea. This eliminates the difficulty of wheel slipping involved when armatures on different axles are connected in series to cut down the voltage across each one.

In the field of alternating-current railway motors the only important innovation has been that made by the Pennsylvania Railroad in its recent electrification of some of the suburban lines in Philadelphia. This motor is of the so-called repulsion type and has a one-hour rating of 225 hp. and a continuous rating of 200 hp. when ventilated with 1200 cu. ft. of air per minute. In this case the repulsion scheme, as originally developed by Prof. Elihu Thomson is modified by the addition of a series connection of the armature and field windings. These windings are, therefore, both "conductively" and "inductively" connected. To the extent that current is induced in the short-circuit armature because of the transformer effect of the auxiliary winding it is a repulsion motor. On account of



Weight Comparison of Old and New Railway Motors

the low resistance of the armature short-circuit, the induced current during the starting period has a high value. It may be well to state here, however, that these motors are still in the process of development, and must still stand the test of hard service over an extended period of time.

To show the general advance that has been made in the way of weight reduction in direct-current motor design the accompanying curves have been plotted. The points through which the curves were drawn were, of course, more or less scattered, but it is believed that the curves represent a fair average. The cycle through which small motor sizes has passed is indicated by the locations of the left-hand termini of the curves. The average weight of a modern 37½-kw. (50 hp.) motor is about 2300 lb. Using it as a basis of comparison the average interpole motor of the same horsepower rating in 1910 was 21 per cent heavier and the average non-interpole motor of 1900 was 32 per cent heavier.

Briefly summarized, as a result of recent progress the limits set by commutation, motor heating, speed and voltage, which fix motor capacity, have been greatly extended. The weight of a motor for a given service has on the average been reduced in the neighborhood of 30 per cent. The reliability of the motor has been increased, as published reports indicate that for modern motors the inspection cost is from 50 to 75 per cent and the maintenance cost 25 per cent of that of the old types. Thus the economies obtained with modern type motors are sufficient, in some services, to justify the replacement of many old motors which are still in good operating condition.

TABLE VII—MOTIVE POWER AND CAR WEIGHTS					
Kind of car	Name or location of road	Car weight tons (empty)	Number of motors	Kilo-watts per car	Kw. per ton
Modern ultra-light weight cars	Puget Sound Type Car	5	2	27.0	5.4
	Tucson, Ariz.	5.5	4	21.0	3.8
	Corpus Christi, Tex.	7	2	26.3	3.7
	Albuquerque, N. M.	5.9	2	26.3	4.4
	New York Rys.	6.1	2	12.0	1.9
	Average (first four)				4.3
Modern single truck cars	Union Rv., N. Y.	12	2	64.5	5.3
	Bangor, Me.	13	2	60.0	4.6
	Albany, N. Y.	11	2	60.0	5.4
	Marshall, Tex.	11.9	2	75.0	6.3
	Average				5.4
Light-weight, double-truck cars for city service	Wilmington & Philadelphia	15.2	4	75.0	4.9
	Buffalo-Erie	15.9	2	52.5	3.3
	Rochester	15.9	2	52.5	3.3
	Des Moines	16.5	4	105.0	6.3
	San Francisco	17.1	4	105.0	6.1
	New Orleans	17.8	2	97.5	5.5
	Chicago	17.7	2	90.0	5.1
	Pittsburgh	17.8	4	105.0	5.9
	New York	18.0	2	75.0	4.2
	Average				5.0
Interurban cars	K. C., C. C. & St. J.	40.5	4	375	9.3
	U. T. Co. of Ind.	42.8	4	330	7.7
	Chi. & Mil.	44.6	4	420	9.4
	Cleve. & East.	29.7	4	195	6.5
	Cleve. & Erie	28.1	4	150	5.3
	Tol., Fost. & Findlay	34.0	4	225	6.6
	Annap. Short Line	40.1	4	225	5.6
	Wash. & Va.	29.0	4	150	5.2
	Average				7.0
Rapid transit cars	Chi. Elev.	35.2	2	240	6.8
	N. Y. Mun.	42.5	2	240	5.6
	Boston Elev.	42.9	2	300	7.0
	Interboro R. T.	38.9	2	300	7.7
	Average				6.8

TABLE—VIII COMPARISON OF LOW-FLOOR AND OLD-STYLE MOTORS		
Motor	Low Floor Type	Old-Style Standard
Rating:		
600 volts	35 hp.	35 hp.
500 volts	30 hp.	30 hp.
Clearance, underneath:		4½ in.
30-in. wheels		
24-in. wheels	3½ in.	
Speed (500 v. 58 amperes)	605 r.p.m.	610 r.p.m.
Diameter of armature	10½ in.	11½ in.
Number of slots	27	29
Turns per coil	3	3
Length of commutator	2½ in.	3 in.
Thickness of shell	¼ in.-1½ in.	½ in.-1½ in.
Diameter of armature shaft	2½ in.	2¾ in.
Weight with gears and case	1750 lb.	2020 lb.

Automobile motors.
Storage battery car.



One of the Five Double-Deck Cars Operated by the Pittsburgh Railways in Service Where Heavy Traffic Is Handled from a Few Loading Points



Busy Interurban Terminal of K. C., C. C. & St. J. Ry. in Kansas City



Difficulties of Traffic Movement in the Loop District of the City of Chicago



In Cleveland the Adoption of the Skip-Stop Plan of Operation Has Permitted the Use of the Trail Car Without Reducing Schedule Speed



Control Systems and Wiring for Railway Motors

Developments in control for recent high-speed cars have been largely simplification of the indirectly-controlled unit-switch apparatus. For city service this system has proved less desirable than the directly-operated platform controller, which, however, is now frequently modified by combination with a contactor to break main circuits beneath the car floor, and to permit door and control interlocking. Another recent innovation in control for four-motor equipments practically eliminates the rheostat and its losses.

CONTROL systems for modern electric railway cars may be classified as direct and indirect, this division being based on the method used in performing the switching. Both use the series-parallel method of adjusting the voltage, wherein the motors, or groups of motors, are arranged first in series and then in parallel, the "non-rheostat" system for four-motor equipments giving an intermediate step with the motors in two series groups.

In order to effect the rearrangement of motors or the change from the series to the parallel connections three schemes are in use, namely, the shunting-out, the bridge and the open-circuit transition. The shunting-out method short-circuits one motor, or group of motors, while the controller handle is being moved from the last series position to the first parallel position on the controller. The decrease in

tractive effort which occurs when this is done tends to produce an unpleasant jerk during acceleration, particularly if the cars are heavy. At present this method is largely confined to control equipments, both direct and indirect, for small and medium size motors. The bridge system is now widely used with indirect control systems for large motors. Direct controllers equipped with the bridge transition have not proved very satisfactory because of the time element involved in making the various circuit connections. The connections in this system are such that all motors are working during the transition period, with the result that a fairly uniform tractive effort is maintained throughout the notching-up portion of the accelerating period. The open-circuit transition at one time was quite widely used in connection with direct control for large motors, but the development of the bridge transition and

the indirect systems of control has rendered it practically obsolete for the heavier classes of service. It is still used, however, with some of the modified forms of direct control.

DIRECT CONTROL SYSTEMS

Of the direct control systems, the most familiar is that in which the Type-K controller is used. Within recent years the most important developments in connection with this controller have been its adaptation for use with field-control motors and the many improvements in structural details. For the more recent designs, 600 volts, 750 volts and 1300 volts are the standard voltage ratings. Those rated at 1300 volts were designed for use on interurban roads having a trolley voltage of 1200, but they have not proved very popular in interurban and all high-voltage services, the tendency being

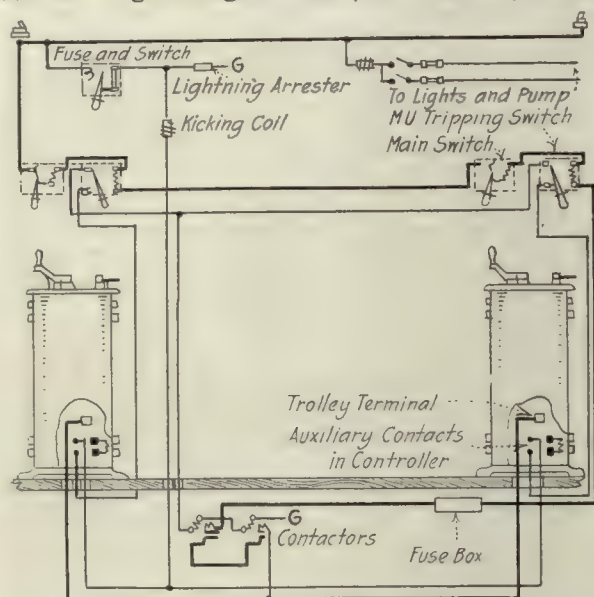


Diagram Showing Connections for Modified Direct Control

toward the use of indirect control. In the way of structural details for the controller itself, many improvements have been made. On modern Type-K controllers, an asbestos-lined wooden cover is used in place of the old asbestos-lined metal cover, thus eliminating the danger of an arc being drawn to the cover. Also the old terminal board, with its soldered joints which were always breaking loose, has been eliminated, and the cables are now connected directly to the finger bases by means of mechanical clamps, and individual blow-outs have been provided for the contact fingers. In general, the tendency has been to simplify the construction and increase the accessibility to the various parts, thus facilitating inspection and repairs.

Direct control was used five years ago on practically all city and suburban cars and on many of the lighter interurban and rapid transit cars. However, in the heavier services this type of equipment was rendered objectionable because of the large

size of controller necessary to provide sufficient current-carrying capacity and to insure the safe breaking of circuits carrying heavy currents, and because of the necessity of running a number of heavy cables to each operating platform, the danger of passengers being frightened by the explosive sounds accompanying switching operations, the inability to operate cars in trains and the great weight of apparatus. Its use to-day is largely confined to city car equipments where the motors are of less than 50 hp. For these small equipments it is a reliable type of control, and because of its simplicity and low cost it is still popular.

A modification of direct control, which was introduced several years ago, has recently come into rather wide use. For small motor equipments it combines a number of the advantages of both direct and indirect control. In this system remote-controlled circuit-breaking or contactor switches are mounted underneath the car to break the main power circuit. These switches are used in connection with a regular cylindrical controller, and they relieve the controller fingers of the heavy arcing and burning incident to the rupture of circuits carrying heavy currents. The controller is provided with an auxiliary contact device on the main cylinder, which consists of two contact fingers operated by a pivoted arm that in turn is actuated by a cam on the controller drum. The action is such that when the drum is turned in the "on" direction the main circuit drum fingers close first and then the control fingers. The power circuit is thus closed by the contactor switches instead of by the main drum fingers. When the drum is turned in the opposite direction the sequence of operation is reversed. The same action may also be arranged to open the contactors in passing from series to parallel. It will be readily seen that this auxiliary equipment relieves the controller of all heavy duty and thereby greatly increases its reliability. Provision may be made for a tripping mechanism which, in case of overload, operates the tripping switch and thus permits the contactors to open. The contactor switches, therefore, also perform the functions of the usual automatic overload circuit-breaker.

This type of control is not only more reliable than the standard direct control, but the use of remote-control switches in the main power circuit makes possible the interlocking of the control system with door opening and closing and other safety devices. In fact, the latter advantage has been very largely the cause of its popularity.

Indirect control was developed primarily to permit the operation of several cars as a unit from the master controller of the leading car, and up to a few years ago its application was largely confined to rapid transit cars, suburban cars on elec-

trified steam lines and electric locomotives. But the success that it achieved in these applications, together with its many advantages where heavy motors are used and space limitations are severe, has led to its more general application.

INDIRECT-CONTROL SYSTEMS

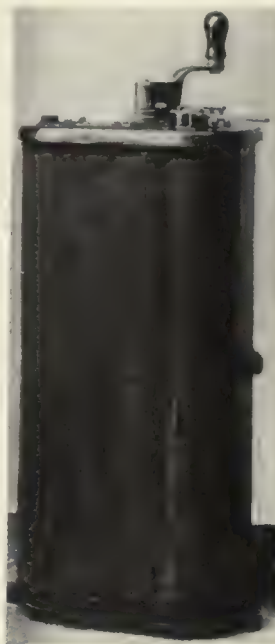
Indirect control is now used altogether for rapid transit and other heavy services and quite widely in interurban service. In the latter case it is almost universal where the contact line carries more than 600 volts. In city service it is being used to a limited extent, largely without the multiple unit feature, however, particularly in connection with some of the low-floor types of car, because of the ease with which the various control features may be segregated and mounted in limited spaces and the readiness with which safety features may be incorporated.

By the addition of a current limiting relay, which opens a control circuit when the motor current exceeds a predetermined value, and suitable interlocking devices, either electrical or mechanical, automatic acceleration can be secured with any indirect-control system. With automatic acceleration the handle of the controller can be thrown to the full "on" position, but the "notching up" will proceed only as permitted by the limit relay. Automatic acceleration insures against abuse of the motors by the motorman, and if the control system is properly designed, tends to provide a fairly uniform rate of acceleration. It has long been used on elevated roads and in other rapid transit service, and in connection with some of the new light-weight, indirect-control designs it seems to be gaining in popularity for city service.

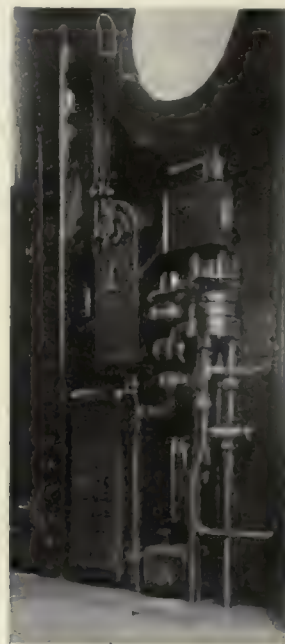
The earlier indirect-control systems, designed as they were for heavy multiple-unit train or locomotive service, were not very satisfactory, even in their improved forms, for services which ordinarily involved single car operation. They were too heavy, and besides, automatic acceleration was quite often a feature of these equipments. This was of importance where operating conditions were more or less uniform, but did not have so many advantages when applied to interurban service. There were the objections, also, of high cost and complexity, the latter being a serious objection on a road that operated only a few cars and could not afford highly-skilled repair shop men. For these reasons, and because of the demand for a control system in which the controller manipulation was the same as with the Type K controller, simplified types of hand-operated indirect-control systems were developed, and during the last five years they have found wide application.

Of these systems, the Westinghouse HL and

the General Electric MK are the best known. In both these systems the arrangement of control handles is similar to that of the Type K controller, and the energy for the auxiliary control circuit is taken through a resistance from the contact line. The main parts of these systems are the main circuit or motor controller and a master controller, the manipulation of which operates in proper sequence the switches of the motor controller. In both systems the switches are of the unit type and are mounted in a compact group. These switches are closed against powerful springs, in the HL system by electrically controlled compressed air cylinders, and in the MK system by powerful solenoids. The unit



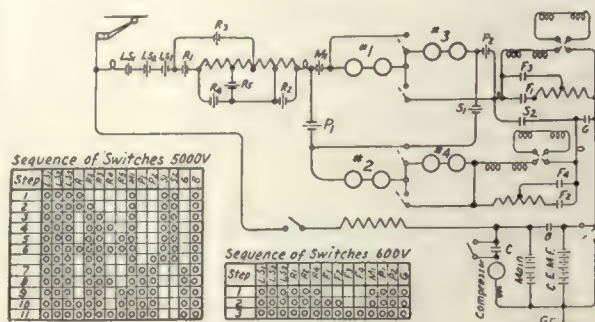
Modern Type K Controller
for Direct Control



Master Controller for
Repulsion Motors

switches are equipped with arc chutes and magnetic blowouts, and are capable of interrupting very heavy currents without severe burning. Instead of the type of automatic overload circuit breaker used with direct control, an overload relay is used which either opens the control circuit and trips out all of the contactors, or unit switches, or else trips a remote-controlled line switch.

These systems have given highly satisfactory service, and their range of application is now such as to cover many voltages and motor sizes. Of late the HL system has been still further simplified by reducing the number of groups and parts. In its light-weight form it is being applied to light-weight cars, and in the heavier-weight forms it is recommended by its manufacturer for general interurban car service. The MK system is now being superseded to a certain extent by a later type known as PC control.



Schematic Control Diagram for 5000-Volt D. C. Equipment

Indirect control systems for use in connection with high-voltage, direct-current motors are essentially the same as those used with lower voltages. The main differences are in the greater amount of insulation, more powerful magnetic blowouts, increased creepage distances, and in the complications sometimes necessary because the motors are required to operate at low voltage within cities. In the latter case, to insure the opening of the power circuit, two switches that are connected in series are generally used to make the interruption.

In connection with the control of alternating motors the only development of special interest is the control for the doubly-fed motor adopted by the Pennsylvania Railroad Company. This control is an adaptation of the unit-switch system, and it is arranged for automatic acceleration. The motors, which are connected in series, are started and operated up to approximately 15 m.p.h., as repulsion motors, with the auxiliary or compensating field, the armature and the main field in series. With these series connections the armature is also paralleled by a resistance. Resistance is inserted with the motors on the first step and is cut out on the second. The third step changes the connections so as to energize the auxiliary field from one portion of the transformer, and the armature and main field, connected in series from another portion, thus affording the doubly-fed connection. The armature short-circuit is removed when the motors are operating with the double feed. Sub-

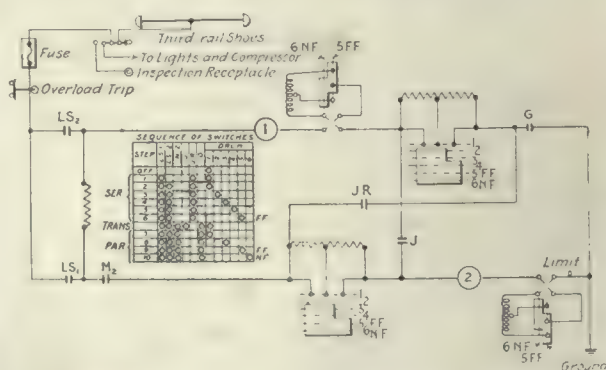
sequent steps in the control are obtained by increasing the motor voltages.

NEW CONTROL SYSTEMS

The control system devised originally for the stepless center-entrance cars of the New York Railways, which is known as the Westinghouse PK control, is a simple, light-weight form designed for use in connection with motors of small rating. It consists, in brief, of a drum motor controller equipped with a power-operated notching mechanism. This notching mechanism consists of a pair of opposed air cylinders whose common piston rod carries a rack that engages with a pinion on the shaft of the motor-controller drum. Electrically controlled valves admit or discharge air from the cylinders in accordance with the manipulation of a master controller located on the car platform. The motor controller may be located on the platform underneath the car or in some other convenient place. A line switch or remote-controlled circuit breaker similar to that used in connection with modified direct control is used to break the main power circuit and relieve the control fingers of serious arcing and burning. It also takes the place of the overhead circuit breaker.

In appearance the master controller is a miniature platform controller. It is provided with a notch for each position of the motor controller in order to make manual acceleration possible, although a current limiting relay of standard type is provided on most equipments and the circuits are so arranged that automatic acceleration will occur in case the controller is moved more than one notch at a time. The latest form of power-operated head can be readily applied to any Type K controller. Energy for the control circuits may be obtained either from the contact line or a storage battery carried on the car.

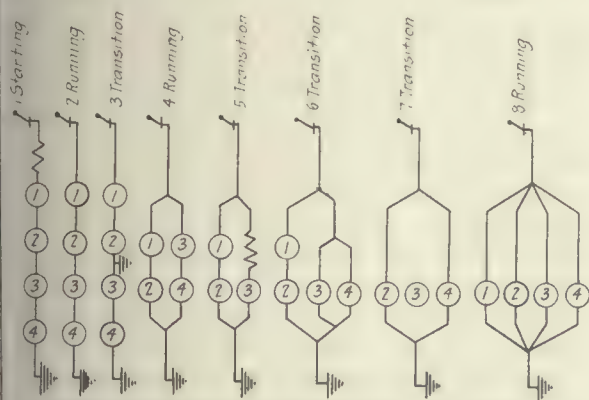
A later control system brought out under the trade designation of Type 214 control is a combination of the principles involved in the PK and the older ABF system. As designed for the field-control motors of the New York Municipal Railway rapid transit cars, the motor controller box includes the following parts: Two unit switches acting as circuit breakers, four unit switches for series paralleling the motors, one drum-type reverser, one drum-type commutating switch, one current-limit relay, one overload relay, one main circuit terminal board and one control circuit terminal board. Electro-pneumatically operated unit switches, interlocked to secure proper sequence, are used for making main-circuit changes while a commutating switch of the drum type, operated by a PK notching mechanism, is used to cut out resistance. A line relay cut-out permits feeding up of the control when power is off the line and the bucking of



Schematic Diagram for Type 214 Control

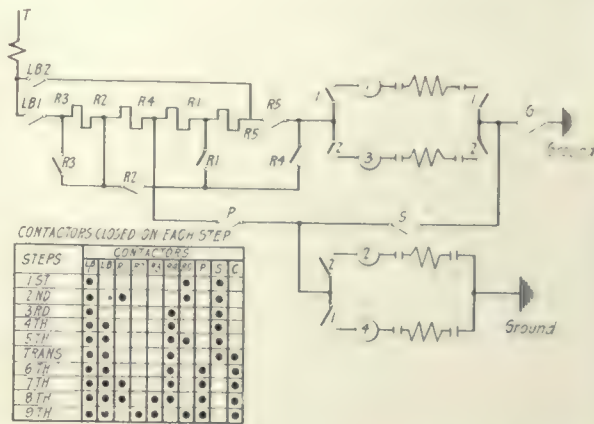
the motors for emergency braking in case of failure of the air brakes.

The automatic acceleration feature of this control is particularly interesting as the action of the current-limiting relay is modified by the current passing through an auxiliary winding of the relay, in such a way as to provide for the same rate of acceleration for all loads. The amount of current passing through this auxiliary winding is controlled by a switch operated in connection with the variable-load brake mechanism. The adjustment of this mechanism corresponds directly to the deflection of the bolster springs under load. Energy for the control circuit is obtained from a 34-volt storage battery which also furnishes energy for emergency car light, signal lights, door interlocks and other special circuits. This control is designed for use with the larger motors, those on the New York Municipal cars being rated at 60 hp. on 600 volts.



Motor Grouping for "Non-Rheostatic" Control

The PC control equipment, recently placed on the market by the General Electric Company is another indirect system designed to secure maximum reliability with minimum weight. It is being constructed in a wide range of sizes, and is expected to supersede the older forms of General Electric direct control. The important parts of this system are a motor controller and a master controller. The motor controller consists of a group of switches and contactor units (used for effecting the series and parallel groupings of the motors and in cutting out resistance), together with a reverser, a circuit-breaker and overload, potential and current-limiting relays, all of these being assembled in a single case. The contactors are closed mechanically by means of cams mounted on a shaft which is revolved by a rack and pinion. The rack is operated by two air cylinders, whose valves are electrically controlled by the master controller. All of the contactor arc-chutes are grouped in one unit similar in construction to that used in the ordinary drum controller. The circuit-breaker switches are also operated pneumatically and controlled electrically.

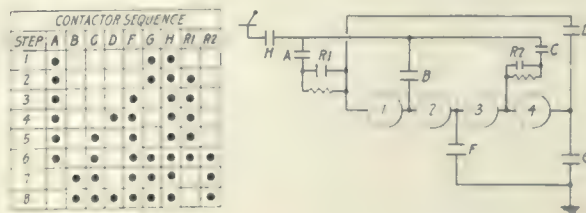


Schematic Diagram and Contactor Sequence for PC Control

The overload relay operates to de-energize the control circuit of these switches in case of excess current. When opened by an overload, a reset switch must be thrown to close them again. The switches are of the unit type and are readily removed. The reverser is very similar to the drum reverser used in a Type K controller, except that it is power operated by means of compressed air cylinders with electrically controlled valves.

The master controller is similar in general construction to that used with the Type M control systems built by the same company. It is provided with a slip-ring attachment which closes the control power circuit when the handle is moved from the "off" to the first position, and maintains the circuit for any forward motion but opens it if the handle is moved back.

This type of control may be arranged either for automatic or hand acceleration, and may receive the power for the control circuit either from the contact line or storage batteries carried on the car. Also, it can be used in connection with large motors and can be designed for high-voltage service. The control circuit requires about 0.3 amp. per car. As with most modern systems of indirect control, the power circuit is opened in case the motorman removes his hand from the control handle and provision may be made also for setting the brakes. As compared with the well-known Type M control, the parts are greatly reduced in number and are grouped into fewer units. Trouble from voltage variations is largely eliminated by the use of the pneumatically operated switches,



Schematic Diagram and Switch Sequence for "Non-Rheostatic" Control

and the cam operation provides for a positive closing of the switches in a fixed sequence regardless of how rapidly the operation may take place. Electrical interlocks on the contactor switches are eliminated.

"NON-RHEOSTATIC" CONTROL

From the standpoint of economy and flexibility in speed regulation, the "non-rheostat" control for the four-motor cars of the Pittsburgh Railways is of interest. In this system resistance is used on only two transition points, the first and the fifth, and as there are three running notches the transition points are used only for very short intervals so that the control is operated practically without rheostatic losses. It has been found that motormen make frequent use of the first running notch, with motors all in series, when following behind slow-moving wagons or when running through congested traffic. As low speed can be secured on this first point, excessive controller operation is avoided, and savings in the maintenance costs of control equipment, wheels and brakes are effected. Tests over an extended interval of time indicate that the energy consumption is from 8 per cent to 15 per cent less than with a standard series-parallel control when used on cars of the same weight operating in a similar service.

The contactor switches for the Pittsburgh cars are arranged in two switch group cases, the reduced size of unit thus obtained making it easy to mount the groups under the low floor of the car. The combinations and connections provide for interlocks on the contactors to establish holding circuits whereby the motors are maintained in parallel groups while the control handle is being thrown to the "off" position, thus affording a closed path of low resistance for the discharge of the energy stored in the magnetic fields of the motors. The use of field control with this system would of course add some complication but would result in a speed flexibility practically equal to that of the steam locomotive.

CONTROL AND WIRING DETAILS

The assembly of the various items of control apparatus into a few groups has materially reduced the number of parts usually classed as control details. In indirect control for city cars the number is often still further reduced by the elimination of the train couplers and other control cable details necessary for multiple-unit operation. There has also been a tendency to group the various auxiliary circuit switches on a single switchboard or in a cabinet.

However, the train line cables in some of the new rapid transit cars have been complicated by the inclusion of extra wires for the operation of elec-

trically controlled brakes, speed-control devices, car signal and door interlocking circuits. In the new cars of the New York Municipal Railway there are eighteen train wires, of which only seven are used directly for control purposes, and the wires are of extra large cross-section so as to permit the multiple-unit operation of a large number of cars.

With indirect systems, a knife-blade switch of the quick-break variety connected between the trolley base and main fuse, and located in a box under the car or some other convenient place, is used to disconnect the main circuit so that the motor controller can be operated for test or inspection purposes. The use of a main fuse box of the magnetic blow-out type is becoming almost universal, the accepted form of fuse consisting of a thin copper ribbon held at the ends between heavy clamps.

The recent introduction of steel and semi-steel cars has brought in a new problem in connection with control, namely, that of effective insulation of the resistance grids from the car frame, and the higher contact-line voltages used of late in inter-urban service have tended to complicate the problem. For this insulation a type of porcelain bolt insulator has been developed and this is giving very satisfactory service. On the older wooden cars more attention is being paid to keeping the rheostats at a safe distance and properly heat-insulated from the combustible material of the car body. Improvements in the resistance grids have been along the lines of increased reliability and weight reduction. Jointless grids drawn from rustproof metal have come into some favor, and the newer cast grids made of alloy metal are less affected by expansion and impact strains and rust than the old cast-iron constructions.

In the earlier attempts to systematize car wiring and reduce fire hazards, the wires and cables were inclosed in wooden conduits, moldings and canvas wrapping. With the advent of steel as a material for car construction, metal conduit similar to that used in interior wiring service came into use. Later practice tends toward the use of light steel conduit that is enameled, galvanized, sherardized or treated in some other way to make it rust-resisting, the conduit for some of the later cars having walls only 1-32 in. thick. In cars designed for very light weight there is an increasing tendency to use some of the fireproof non-metallic conduits now on the market. Of these one that has been extensively used is made of natural warp cotton yarns woven very tightly to give it strength and saturated with a waterproof and fireproof compound. It is more economical than metallic conduit, not only because the price is much less but also because no fittings are required, since the non-metallic conduit can be bent into any desired posi-

on. The provision of a single wall prevents blistering and breaking down, and provides a corrugated inner surface permitting wires to be fished through without difficulty. The weight of $\frac{3}{4}$ in. conduit in this material approximates 0.13 lb. per ft., while metal even 1-32 in. thick should weigh 25 lb., including the fittings.

The arrangement of control details in a few groups has greatly simplified the control wiring necessary, and there is a tendency to use multi-conductor cables for the motor and other current-carrying leads instead of single wires. This facilitates the placing of a number of leads in a single conduit. For the wiring of lighting and other auxiliary circuits, the best practice calls for the use of some form of approved conduit, either metal or non-metallic, or metal molding together with suitable fittings.

With regard to lightning arresters, it may be said that a difficulty experienced with many of the earlier types was that the voltage at which the arrester would start to discharge was higher than the break-down voltage of the insulation of the motor windings. Other than the remedying of this, recent improvements have been in details of construction rather than the development of new principles of operation. The magnetic blow-out types are still very popular for car service, and a form of condenser arrester seems to be meeting with some favor.

The aluminum-cell type of lightning arrester has been adapted for car service, and while it is without doubt the most efficient of all the protective devices now in use it has not met, as yet, with great favor among operating men. Its bulk, first cost, and the care necessary in its installation and maintenance are the chief objections urged. However, several companies have installed it on their latest types of cars. Modern arresters are more sensitive than the older ones, and far more care is being taken in their installation and maintenance. There is a tendency to use larger choke coils than

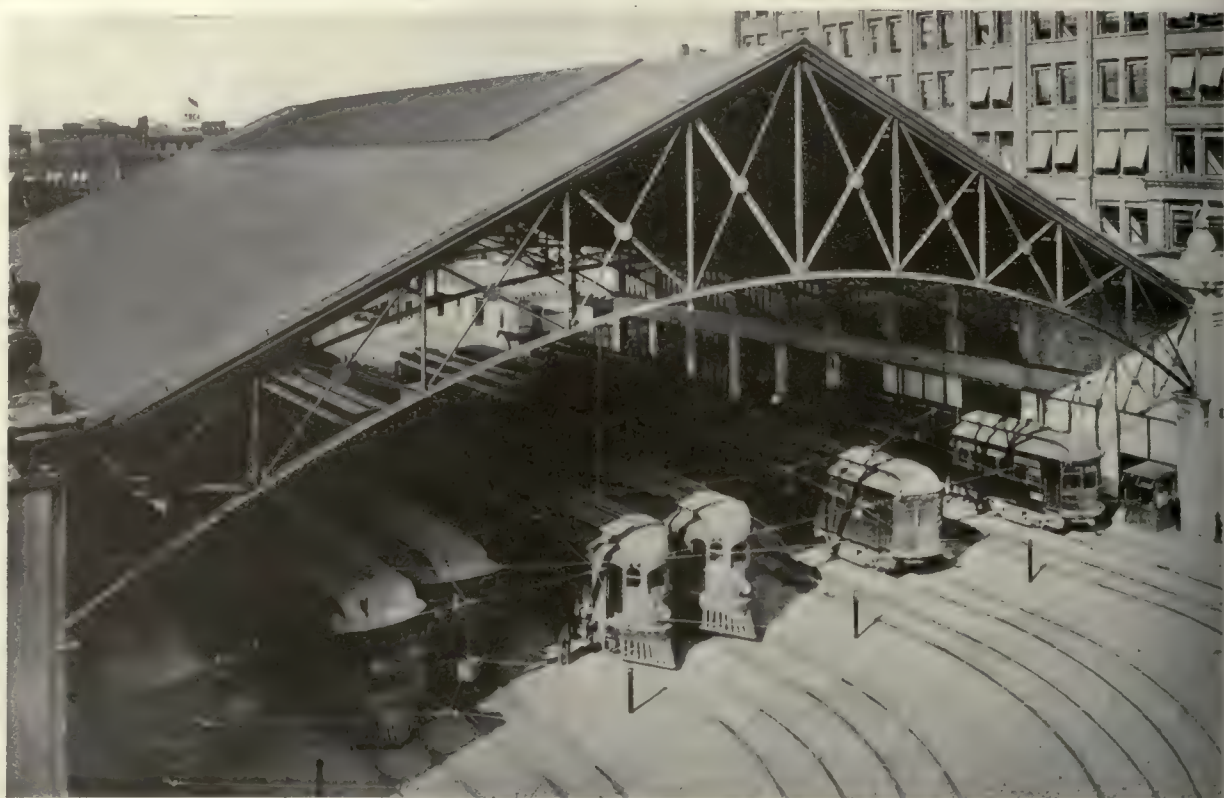
were used formerly. The favored location of the arrester seems generally to be on the roof of the car.

CONTROL CIRCUIT AND DOOR INTERLOCKING

In an effort to promote safety and accelerate traffic, several methods of interlocking the car doors and the control system have been devised. Generally speaking, any of these schemes is applicable, as far as principle is concerned, to any system of indirect control as well as to the system of modified direct control. The door apparatus consists of a wooden rod attached to the door and upon which is a brass ferrule. When the door is closed this ferrule engages with a pair of contactors which form a part of the circuit energizing the contactor, or line switch in the motor control. In any position of the door, except tightly closed, these contactors engage with the wooden surface of the rod and not with the brass ferrule. Consequently, the contactor control circuit is open and the contactor itself cannot be closed, but when the door is shut the control circuit is complete and the motors are under the control of the motorman. This enables a motorman to set his controller handle on the starting position immediately after a door is opened at a stop. Then, when the door closes, the car starts ahead at once without any signal from the conductor. Frequently switches are provided that operate in connection with the conductors' emergency brake valve. The operation of this valve, therefore, shuts off the power as well as sets the brakes, and eliminates the current surge that would result if the motors pulled against the brakes until the overload relay tripped.

Such interlocking devices, by permitting a quick start after passengers are loaded, have a very marked effect in speeding up traffic. They eliminate to a large extent the need of a signal system for the conductor, and by requiring the door to be shut before the car can be started, reduce the number of door and step accidents.





Current Collection and Utilization

Large-diameter trolley wheels for high-speed cars, air-retrieving trolley bases, and the introduction of a sliding shoe in place of the trolley wheel constitute the most important recent innovations in connection with current collection. For promoting efficient utilization of current, new devices such as the air-brake and control interlock, the mercury-float wattmeter and the coasting clock have provided means for economies that have been reported in some instances to be 25 per cent of the total energy that is consumed.

RECENT developments have been few in connection with the collection of propulsion current for electric railway cars. In city service the length of time during which the wheeled trolley has been universally standard has practically limited changes to matters of detail, and even in regard to details, the introduction of innovations has been exceptional. The problem of efficient utilization of the current collected by these several means, however, had been almost unconsidered until about three years ago, and the remarkable growth of interest in the subject of economy in current consumption since that time is one of the really striking features of modern electric railway practice.

Equipment that is installed on electric railway cars as a means to this end may be classed under two general headings, namely, direct-acting devices that definitely prevent the waste of current, and apparatus designed merely to serve as a check upon the efficiency of the motorman. In the former class are included the several well-known mechanical controller regulators, which, however, seem gen-

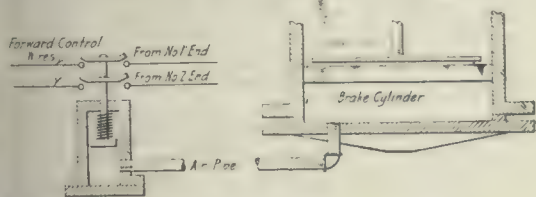
erally to have lost in popularity of late, and also field-control, non-rheostat control and the various means for producing automatic acceleration which have been already touched upon in the previous chapters on motors and control equipment.

In addition, there has appeared a simple but very effective device called an air-brake and control interlock which prevents the working of current through the motors until the brakes are fully released. This apparatus was developed some two years ago on the New York, Westchester & Boston Railway not only to save current, but to reduce heating of motors by over-hasty motormen who frequently apply power before the brakes are released after a sudden slow-down. It consists of a plain switch that is placed in the main control circuit of the indirect control system and is operated by a small air cylinder directly connected by a small pipe to the brake cylinder on the car. Therefore, when any air pressure exists in the brake cylinder, the switch is held open by this pressure which acts on the switch-operating cylinder, and current can-

not be applied to the motors. But when the air-brakes are fully released the switch is closed by a spring, and the control is operative as under ordinary conditions.

Devices that furnish a check upon the motorman's methods of handling the controller are available in the form of wattmeters and ammeters, which measure the current consumption directly, and coasting clocks, power-mileage meters and current-time clocks, which are designed to provide a measure of the efficiency of the motorman in his utilization of power. Of these several devices the wattmeter and the coasting clock are by far the most prominent, and it seems likely, in fact, that eventually one or the other will be installed as an indispensable part of every car equipment.

The wattmeter in its latest form is typical of the electric instruments used in powerhouse operation, being provided with mercury-float bearings to eliminate the disturbing effect of the vibration found in railway-car service. With it is provided a registering apparatus whereby the machine issues a printed record of the energy that is consumed, the recording mechanism being set when the run begins and the printed slip withdrawn and turned in by the motorman when the run is completed. The



Air-Brake-and-Control Interlock

advantage peculiar to this equipment is, obviously, its simplicity. It gives direct readings of the energy consumption, so that such savings in energy as the motorman may make are recorded without interposition of other factors.

The coaster clock, which is designed to record the time spent in coasting, or permitting the car to run by momentum without using power, is based upon the principle that, for any given cycle of movement between two stops, the percentage of coasting time approximates the percentage of energy saved over the amount which would have been consumed if the cycle had been made without any coasting whatsoever. The device, therefore, does not provide a direct measure of energy consumption, but is designed to register the relative efficiency of different motormen on any particular run. The advantage of such indirect measurements is that they are independent of some of the variable factors in energy consumption such as the weight of car. It might be remarked here that, in its latest form, the coaster clock has been very greatly elaborated, so that it now provides important information on traffic mat-

ters as well as on the utilization of current. On the slip that is withdrawn from the clock and turned in by the motorman at the end of his run there is printed separately for each trip the number of stops, the total time stopped, the coasting time, the badge number of the motorman and the car number.

The savings that may be made by the consistent use of either the wattmeter or the coasting clock are literally enormous, reaching a maximum in city service, where the frequent movements of the controller offer a wide field for the exercise of judgment on the part of the motorman. Where no such equipment is installed there is, of course, no chance whatsoever for knowing how much energy is being wasted, and except in cases where special attention is paid to the subject, and instructors or traveling motormen are employed, the introduction of the apparatus seems generally to reduce the energy consumption by at least 10 per cent. In extreme cases savings of the order of 25 per cent have been reported, but these figures apply only to city service, and for interurban runs a range between 5 per cent and 10 per cent appears to be representative.

However, with the assumption that a minimum figure of 10 per cent for city service is conservative, it is possible to approximate the savings that may be effected. In the case of a city car weighing with load, say, 20 tons and making, say, 20,000 miles during the year, the annual energy consumption, at 125 watt-hr. per ton mile, would be 50,000 kw.-hr., and with a power cost at the car amounting to, say, 1½ cents per kw.-hr., the total annual expense for power would be \$750. The saving of 10 per cent of this sum annually which should be brought about by the introduction of energy-checking apparatus would, therefore, be sufficient to make a wattmeter on each car pay for itself in about nine months, or a coasting clock in about twice that time. Clearly enough, this opportunity for economy is one of the most important that has been presented to the electric railway industry, especially in view of the fact that all the above assumptions are conservatively low.

CURRENT COLLECTION BY TROLLEY

In connection with current collection for city and interurban cars, for which the wheeled trolley is practically standard on account of its simplicity, ruggedness and ability to operate satisfactorily with a festooned contact wire, the most radical recent development in design lies in the numerous experiments with wheels of extremely large diameter. This idea has been based upon the obvious principle that wear decreases as the wheel diameter increases. On the Oakland, Antioch & Eastern Railway the introduction of 10-in. trolley wheels three years ago were reported to have practically eliminated serious difficulties of jumping and burning,

and gave a wheel life of the order of 5,500 miles, as against the 4,000 miles that may be said to represent an average life in high-speed interurban service. At the same time the 10-in. wheel was said to have normally collected 900 amp. for thirty minutes continuously without heating, the pressure against the contact wire being 35 lb.

The large wheel, however, does not appear to have any field in city-service, where 4½-in. diameters are very frequently used. The reason is that the weight of the wheel appears to be of vital importance because of the influence of inertia on the ability of the wheel to follow irregularities in the wire. Thus, a weight of about 3 lb., which might be expected with a small wheel, obviously should follow irregularities in a fairly rigid overhead construction better

has been found to give nearly double the mileage of one 4½-in. in diameter, and it involves only half the expense for changing and oiling wheels, while the price of the large wheel is less than double that of the small one. However, when a diameter larger than 6 in. is used the increase in weight, without giving any more wearing surface, is too great to be carried on the end of a trolley pole, the tension having to be increased to a point such that, if the wheel should leave the wire the overhead construction would be badly damaged.

TROLLEY EQUIPMENT DETAILS

An attempt to eliminate altogether this mooted question of trolley-wheel diameter has been made very recently by the introduction of a grooved slid-



Wattmeter Located to Permit Direct Reading by Motorman

than the 10½-lb., 10-in. wheel above mentioned, although, of course, when there is much "give" in the contact wire this advantage is clearly reduced. In addition, the question of wheel life in city service is of much less importance than it is with high-speed cars, since mileages of 20,000 are common.

However, neither the small wheel for city service nor the extremely large wheel in high-speed operation receives universal support, this being exemplified by the belief of one prominent maker of trolley equipment to the effect that a 6-in. wheel produces best final results for all purposes and conditions of service. This is based upon the idea that with a slowly-revolving wheel there will be provided better contact, greater reliability in holding the wire and less lubrication. Thus, a 6-in. wheel



Coasting Recorder Mounted in Motorman's Cab

ing shoe for the customary wheel. This has a specially-hardened steel contact piece set at the bottom of a grooved housing, which is mounted on trunnions to permit the shoe always to rest flat against the trolley wire. The object in the use of steel for the contact piece is to reduce friction and wear on the copper contact wire, the length of bearing of about 6 in. permitting the low contact pressure of 18 lb. without causing arcs. Shoe mileages of 10,000 are reported, and it is said that micrometer measurements indicate the wear on the contact wire to be no greater than the standard wheel on tangents, and actually less on curves, possibly because the shoe clings to the wire better.

Trolley harps, in the general form, have become quite thoroughly standardized, the important char-



Air-Retrieving Trolley Base

acteristics being ample lubrication for the pin on which the wheel rotates, and good sliding contact between the sides of the wheel hub and the flat-spring shunts that are attached to the sides of the harp. Ears for the harp appear in many instances for the purpose of preventing the wire from being caught anywhere but in the groove of the wheel. For the trolley base, whose primary function is to provide free motion for the trolley pole, as well as to support it, ball-bearing and roller-bearing designs have come into very general use.

Recently an air-retrieving trolley base has been developed to take the place of the various commonly-used trolley catchers and retrievers which are mounted on the rear dash, and which operate in general by the action of centrifugal force on a series of dogs and latches within a drum over which the trolley rope is wound. The air-retrieving base, however, depends upon the action of main reservoir pressure in a cylinder cast integral with the revolving part of the ball-bearing base, the piston within this being connected to the trolley pole. The pole is normally held against the wire by tension springs, and small breathing ports in the cylinder permit the piston to make gradual movements with perfect freedom; but if the wheel leaves

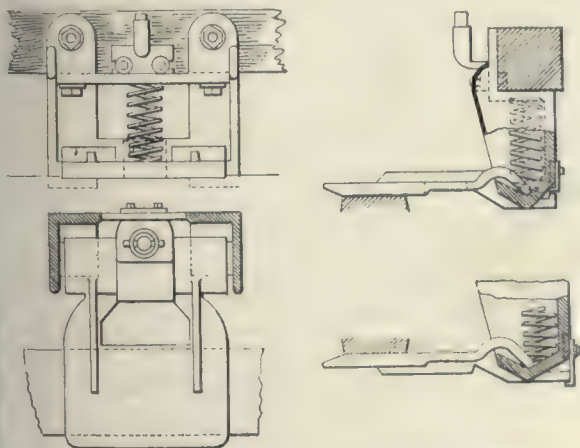
the wire the sudden movement compresses the air in back of the piston, and opens a differential valve in the cylinder head, the small section of the differential valve opening a passageway from the main reservoir into the cylinder so that the pole is pressed down against the spring tension. An air cushion is provided to prevent damage to the roof from the rapid movement of the pole, and there is a locking device to prevent the retriever pole from swinging laterally. Release is effected by a valve in the pipe connecting the base to the main reservoir.

PANTOGRAPHS AND THIRD-RAIL SHOES

With pantograph collectors, almost the only feature that has not become standard is the contact surface. Both rollers and flat pans have been installed at comparatively recent dates, and on direct-current the former have given a life for the shoes of steel tube ranging between 20,000 miles and 50,000 miles. Roller bearings for the rollers, however, appear to be necessary, and as this increases the cost materially, the tendency at present appears to be to prefer the simpler design of a plain contact pan, ordinarily about 4 ft. long and with curved aluminum horns at each end. Light weight is, of course, an essential to permit the shoe to follow closely any irregularities in the overhead wire, and in one of



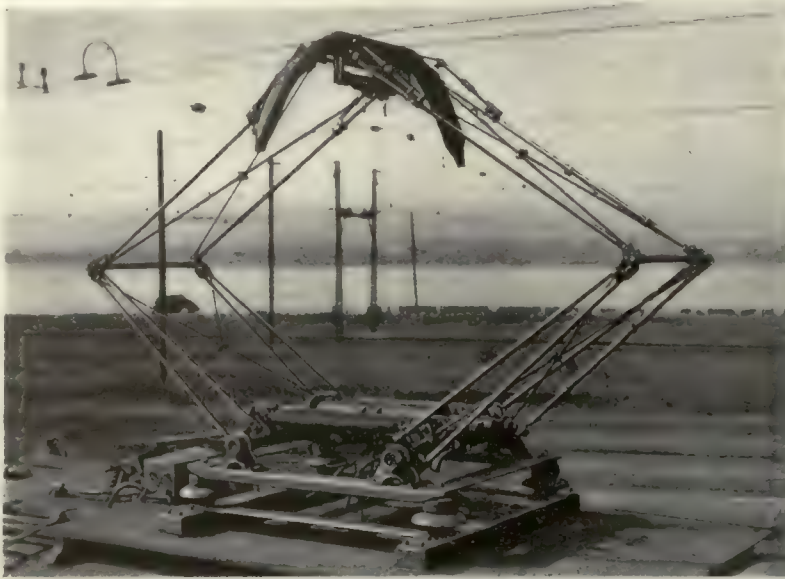
Sliding Trolley Shoe



Detachable Third-Rail Shoe for Under-Running or Over-Running Contact Rail

the latest designs the shoe is carried on auxiliary spiral springs seated on the pantograph frame, so that small movements do not affect the framework as a whole, but only the mass of the shoe itself. To meet the demand for light weight, shoes have been made of metal as thin as 1/16 in., weighing only 7 lb. The same idea of light weight appears in the use of steel tubing of No. 22 gage for the pantograph arms, and under these conditions vertical pressures of only 10 lb. between the shoe and contact wire (measured when the shoe is being pressed down) have been permitted.

Both the material of which the contact surface is made and the life of the shoe display very great diversity in modern installations. Black steel shoes 1/16 in. thick, working against a steel contact wire that carries alternating current, have had a life approximately 2,500 miles, while 1/8-in. shoes on direct current have been reported to have attained 25,000



Roller-Type and Pan-Type Collectors for Pantograph Frames

miles. Strange to say, considerably less mileage than this has been reported where steel shoes work against copper wires. In the latest installation of pantographs, however, copper against copper has been adopted as the result of exhaustive tests, but at the present time insufficient data are available to establish the life with the combination. The question of greasing the shoe, also, is still altogether unsettled, since some railways have dispensed with lubrication of every kind for the contact surface, and state that no difference in wear is discernible, while others claim the use of grease to be almost an essential to reasonably long life for shoes.

In the design of third-rail shoes the only improvement of note that has been developed is the attachment of the shoe proper to the supporting bracket only by the pressure of a short spring, so that if the projecting shoe strikes an obstruction, or catches in the third rail, it is knocked free from the bracket without breaking the latter. Under such circumstances the shoe itself is seldom damaged, and if it is picked up from the side of the

track and turned in at the shop it may be used in another car. The arrangement involves the use of a shoe which is practically flat, but which has three extensions at the inside for the support. The outer two sections are bent downward at an angle, and the ends rest in short troughs formed at the sides of the supporting bracket. The center-portion of the bracket is open, and a spring extends from the beam on which the bracket is carried to the central extension of the shoe. When the shoe is over-running, as is the case on the Hudson & Manhattan Railroad, where the design was developed, the spring seat is placed outside of the line of support at the ends of the curved extensions and the spring thus holds the outboard portion of the shoes downward against the rail. When an under-running shoe is desired, the spring seat is moved inward until the contact surface of the shoe tends to rise. No bolts are necessary, and to remove the shoe the curved extensions are merely pulled out of the troughs against the pressure of the spring. No lubrication is needed, and no shunts are required.

Large illustrations of street scenes and other views appear on various pages of this publication. For the information of those who may be interested the localities thus represented are listed by pages as follows:

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"First—The work of rebabbitting journal brasses should be done at the main shop and by one man, so as to place the blame for poor work that is being done.

"Second—That a more liberal supply of new brasses be placed in service, as there are a number of the old ones that must be scrapped.

"Third—That as soon as possible rebabbitting of journal brasses be discontinued and the brass be allowed to wear to a scrapping point and then taken out of service.

"Fourth—On account of the high speed and weight of cars, there should be a more liberal renewal of high grade packing, as a large proportion of the journal packing now in service is short strands, and while it would prove satisfactory in slower service, it is not conducive to good operation under the present conditions.

"Also, I have *requested* them to discontinue a practice which, no doubt, has been the cause of a part of the journal trouble, and if continued it will ruin the journals. I refer to a block of wood that has been made in the form of a journal brass and when they have a hot journal they remove the brass and put in the block of wood with a sheet of emery cloth on its face and then run the car. The result is another hot journal, as it is impossible to remove all the emery from the journal without removing the journal box. Furthermore, any irregularity in the journal face or diameter will be aggravated by such a proceeding and new journal brasses will have so little surface in contact with the journal that the weight per square inch is out of all proportion to what it should be. This was proven by an inspection of journal brasses that had only been in service twenty-four hours. The journal box dust guards have not had the attention they deserve, and there are a number of journals without them."

Little things? Yes. But it was the viewpoint of a practical outside man that discovered them and realized their important effect on good service. That is what our Experts will do for you—point out the little faults, far reaching in their unfavorable effect on your service, that you have lived so close to that they have been unnoticed. And note that our man made only SUGGESTIONS and REQUESTS of the railway officials—no commands, no arbitrary demand that such and such a thing be done—it is up to the officials to accept or reject our recommendations. But the wide-awake railroad man is looking for practical advice. And we are equipped to give it to him.

Galena-Signal Oil Co.

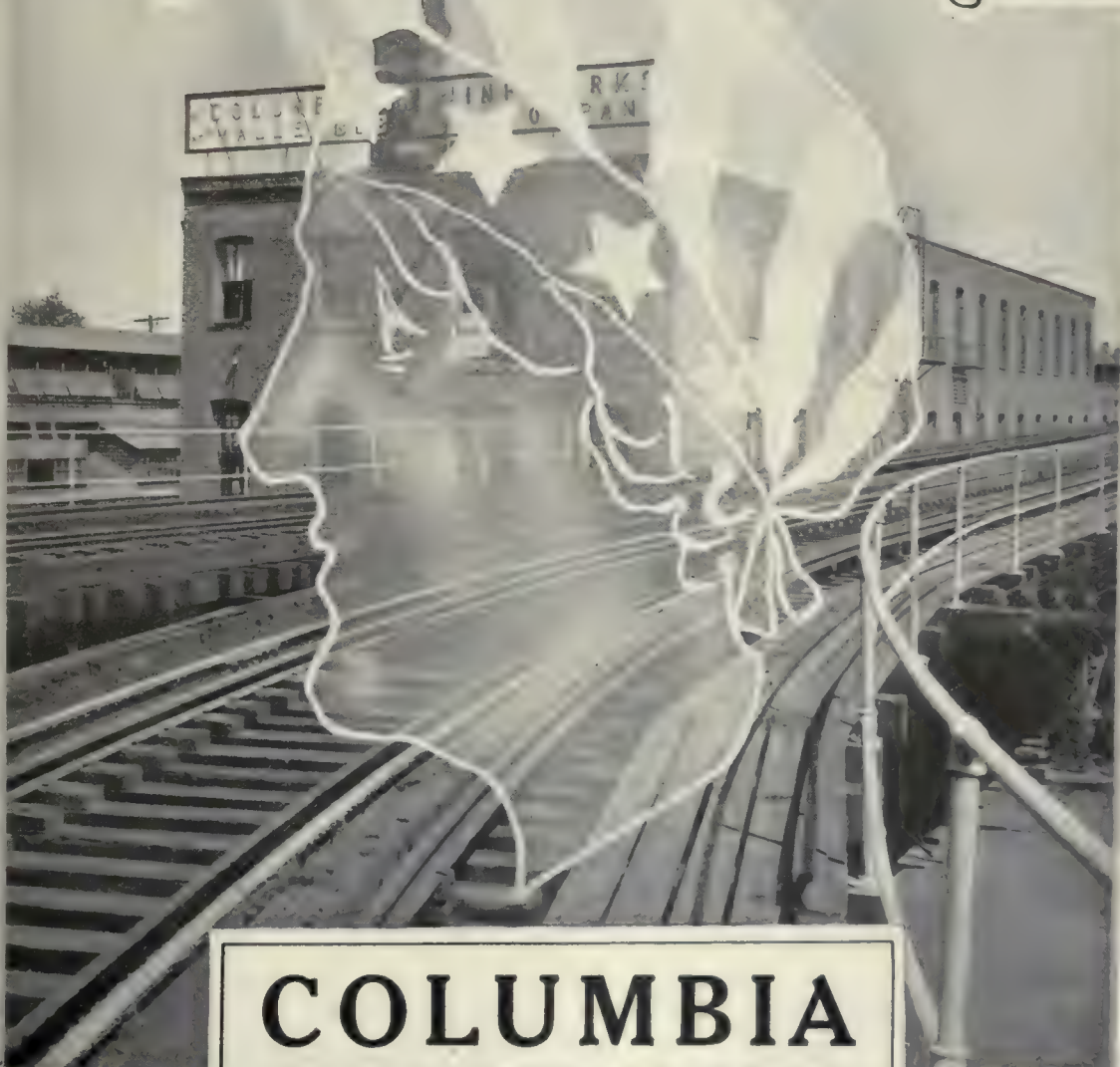
Franklin, Pa.



J.G. BUEHLER
President & Treasurer



L.O. SMITH
Vice President



COLUMBIA

This business was founded in 1891 by John G. Buehler as the Columbia Machine Works.

In 1902 it was incorporated under its present name—the Columbia Machine Works & Malleable Iron Company.

Every year has been marked by a better, broader and bigger output—\$5000 in 1901, \$1,000,000 in 1916—

Because we have held to the policy of "Right goods, quick delivery, moderate profit."

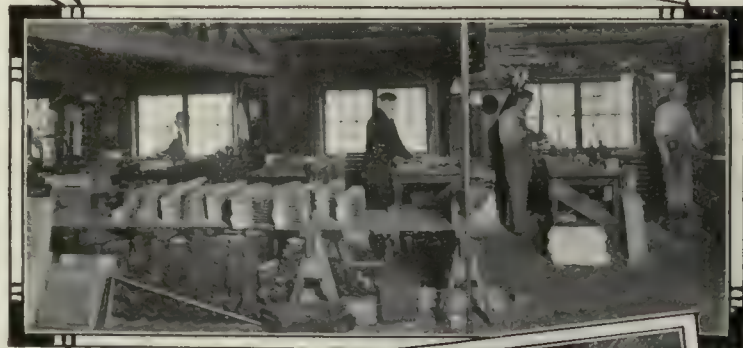
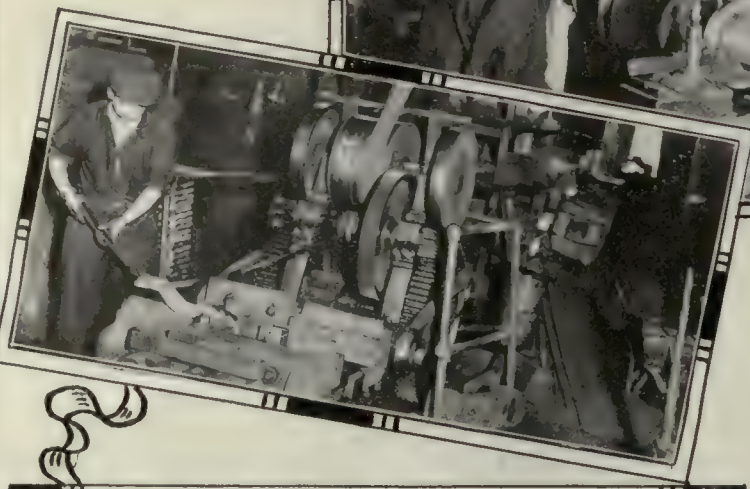
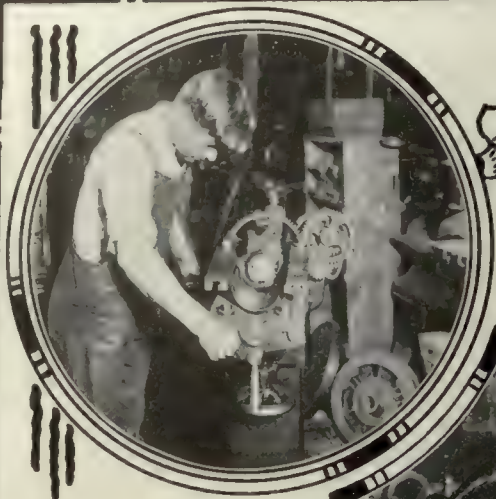
W.R. KERSCHNER
Vice President



CHARLES BUEHLER
Secretary



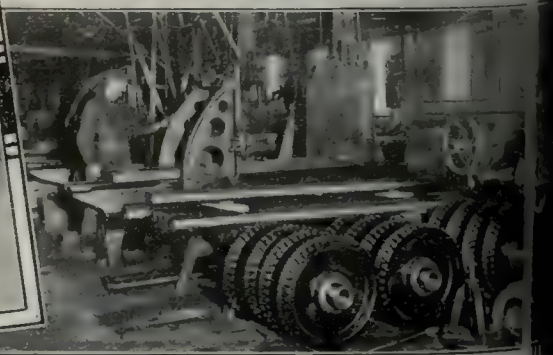
Columbia Machine Works & Malleable Iron Co.
Atlantic Ave. and Chestnut St., Brooklyn, N. Y.



These pictures give some idea of our extensive facilities.

Our own brass and iron foundries, forges, power hammers, bulldozers, lathes, drills, borer and other equipment make this plant self-contained and capable of handling with despatch the biggest manufacturing jobs you may have.

Columbia Machine Works
Atlantic Ave. and Chestnut St.



Scene Columbia

from the Workshops

Naturally, our shops are well departmentalized.

The high quality of our work, the promptness of our deliveries and the reasonableness of our prices are promoted in no small measure by this specialization.

Allegheny Iron Co.
Pittsburgh, N. Y.



The Scope of Columbia Products

THE accompanying list of Columbia Tools and Columbia Car Equipment gives only an approximate idea of the amazing variety of our manufactures.

TOOLS

Armature and axle straighteners
Armature shaft straighteners
Armature buggies and stands
Babbitting molds
Banding and heading machines
Car hoists
Car replacers
Coil taping machines for armature leads
Coil winding machines
Pinion pullers
Pit jacks
Signal or target switches
Tension stands

CAR EQUIPMENT

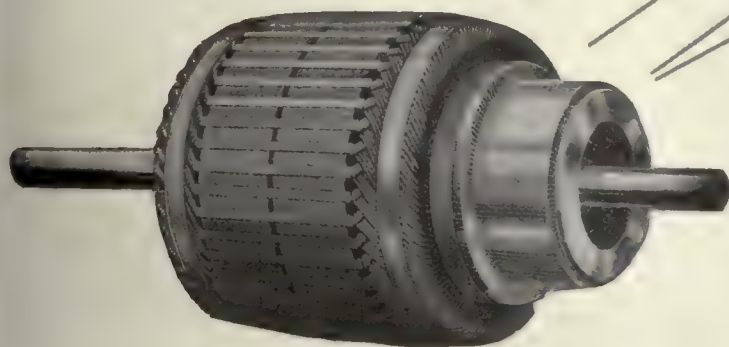
Armature and axle bearings
Armature and field coils
Bearings (bronze and iron)
Brush-holders and brush-holder springs
Brake, door and other handles
Brake forgings, riggings, etc.
Car trimmings
Commutators
Controller handles
Forgings of all kinds
Gear cases (steel or mall. iron)
Grid resistors
Third-rail shoe beams and accessories
Trolley poles (steel) and wheels

IN addition, we are prepared to make window and vestibule framing, car sheathing, draft rigging, manhole covers, lighting standards, patterns, jigs, templates—in fact almost anything that an electric railway needs.

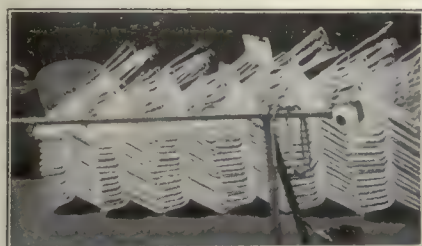
**Columbia Machine Works
& Malleable Iron Co.**

Atlantic Ave. and Chestnut St.,
Brooklyn, N. Y.

Four Cameron Armature Cost Cutters

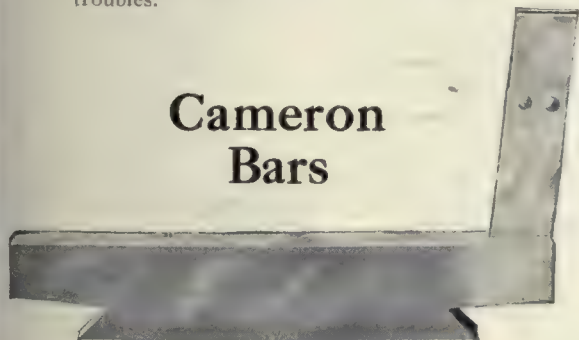


Cameron Coils

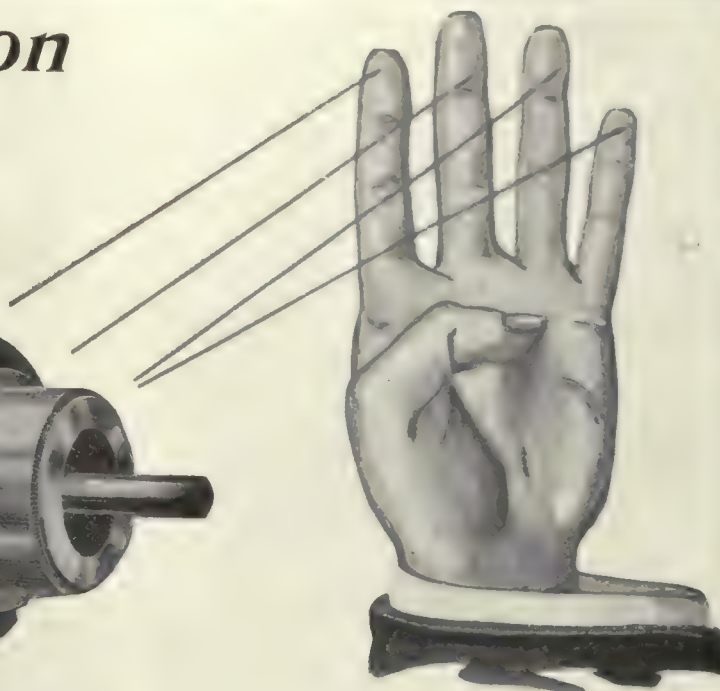


Of the best obtainable metal, and properly wound to withstand overload without deteriorating under the highest service temperatures. They are factors of safety against generator or motor troubles.

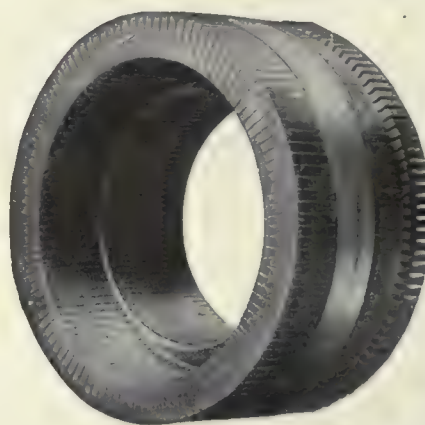
Cameron Bars



NOT the drop forged type, but bars made of pure hard-drawn copper giving high conductivity. Inserted lugs may be ordered which are completely ready for the armature lead connections. They are great labor savers.



Cameron Commutators



Made absolutely tight by hydraulic pressure, thus eliminating the danger of loose bars and arcing brushes. True to gauge, and guaranteed against defects.

Cameron Mica

Of "Canadian amber," giving soft, uniform wear, and reducing truing-cost.

Send for Catalog and Prices

Cameron Electrical Mfg. Co., Inc.

Ansonia, Connecticut, U. S. A.



Duff Ball Bearing Screw Jacks

are adaptable to any lifting need. They are quicker, more durable and reliable and less expensive than any other design of standard speed ball bearing screw jack.

Duff Bethlehem Forged Steel Hydraulic Jacks

embody the best there is in the hydraulic jack principle but avoid many of the troublesome imperfections of usual hydraulic jack construction. Packing leaks are avoided, tripping is made easy and perfectly true foundations are made unnecessary with these jacks.

THE DUFF MFG. CO.

Established 1883

PITTSBURGH, PA.

50 Church St., New York
Peoples Gas Bldg., Chicago
Candler Bldg., Atlanta

Is Your System Barrett-Protected



Barrett Emergency Car Jacks

are doing important rescue work and building up public good-will on thousands of cars. Every car on such lines as the Bay State, Pittsburgh Railways and Philadelphia Rapid Transit System is equipped with Barrett jacks.

Over 30 years' experience is at your service. Avail yourself of it either through our standard stock or in commanding the services of our engineering department for jacks of special or individual design. The Barrett Catalogs are ready for you. How shall we address them?



Barrett
"Bay State"
Emergency
Car Jack
No. 239

15 Tons Capacity
Single Acting



The Yale Triplex Block reduces the gang from twelve men to two.

The Steel Vitals of the Yale Triplex Block

Every chain block user should know them for his own protection.

They are:

1. Yale Safety Top Hooks
2. Yale Steel Suspension Plates
3. Yale Load Sheaves
4. Yale Gear and Pinions
5. Yale Driving Pinion
6. Yale Continuous Hand Chain Guide
7. Yale Steel Chain
8. Yale Safety Bottom Hook
9. Yale Overload Test and Inspection

The design and construction of these steel vitals are the result of years of study and test under working conditions, always seeking greater safety.

For sale by machinery supply houses
Put your hoisting problems up to us
New catalog upon request



The Yale Triplex Block



Yale Steel Vitals

The Yale & Towne Mfg. Co.
9 East 40th Street New York



Concrete Examples of the Service Rendered by Davis-Bournonville Apparatus



These are the plain, unvarnished facts of what the Elmira Water, Light, and Railroad Company did with Davis-Bournonville Apparatus.

Repaired a Pump Cylinder 14" x 34", crack 20", shell 2½" and 3½" thick. Time 2½ hrs. Cost \$10.10.

Repaired pinhole caused by leak in Cast Steel Boiler Head. Cost 25c to reclaim.

Manganese Switch Tongue—Weld size 2½" x 4". Cost \$2.50.

Grate Carrier Frame for Boiler—Welded. Cost 50c.

Boiler tube blistered—Pounded in place. Cost per blister 10c.

Out-of-date Fish Plates wanted for repairs. Reclaimed at 20c each, from scrap pile.

Welding of broken gear cases is one of the most frequent applications. The field of usefulness of Davis Bournonville apparatus is unlimited in the repair department.

See Our Exhibit at the Convention

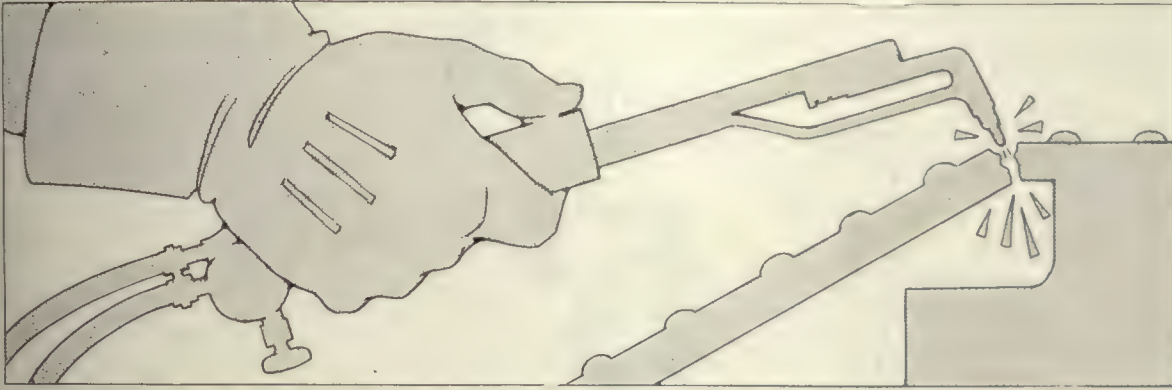
We will occupy spaces 207 and 209, opposite the aquarium

and write the General Office for data and information about equipment. "Davis Apparatus" leads the World in Range, Efficiency, and Volume of Apparatus in Successful Use.

DAVIS-BOURNONVILLE COMPANY
NEW YORK CHICAGO

GENERAL OFFICES AND FACTORY: JERSEY CITY, N. J.

SALES OFFICES: NEW YORK, CHICAGO, CLEVELAND, DETROIT, PITTSBURGH, PHILADELPHIA, BOSTON



A New Job For Oxweld Apparatus

is discovered every hour of the day in the electric railway field, but one of the largest traction companies in Michigan recently uncovered a brand new way to make the scrap pile replenish the store room; they now

Cut Car Repair Parts From Heavy Steel Plate

These people no longer buy expensive forgings for many repairs; they simply lay out the parts on 1¼-inch steel plate and apply the Oxweld Cutting Blowpipe; very quickly the replacements are ready, cut to dimension and with a smooth, clean edge. Scrap metal is used for smaller parts. Oxweld-cut plates are stronger than forgings—the fibres of the steel are not injured or disturbed and the work is accurate—results not always so certain in forgings. Here are just a few of the shapes they make:

Radial Draw Bars

Truck Equalizer Bars

Brake Cylinder Floating Levers

Carry Irons

But electric railways have hundreds of other uses for Oxweld Apparatus—reclaiming broken and worn castings and forgings in the car shop; making machinery repairs in the power house; rail-bonding, repairing frogs, switches, etc., out on the line. Every day you will find profitable use for your

Oxweld Portable Welding and Cutting Unit

Cheapest to buy—to operate—to maintain

When you buy a piece of equipment as a measure of economy, you naturally seek the most efficient—that's OXWELD, in the welding and cutting field. The exclusive "injector type" construction insures an economy of gases and time and a certainty of results that you should know about before you buy.

Send for Bulletin
Series 700-R

telling about some of the economies Oxweld Outfits are producing in your field. You'll be interested.

OXWELD ACETYLENE COMPANY

LARGEST MAKERS OF OXY-ACETYLENE APPARATUS AND SUPPLIES IN THE UNITED STATES

NEWARK, N. J.

CHICAGO

LOS ANGELES



“Hitting the nail on the head”

That's what we have been trying
to do ever since we first built the

Ford Tribloc Chain Hoist

Have we succeeded?
Let the following facts answer.

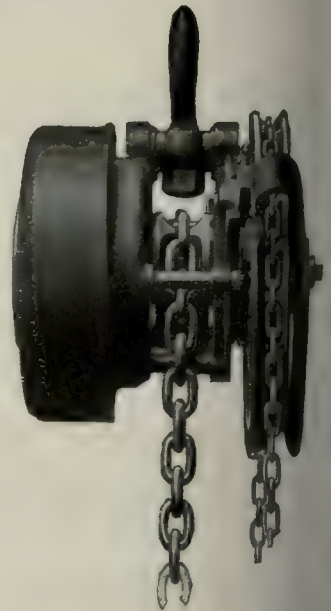
We introduced steel working parts in place of iron used on other hoists, making a longer wearing, safer hoist and at the same time cutting down repair bills. We made the patented Loop Hand Chain Guide a part of standard equipment. This guide prevents gagging of the hand chain no matter at what angle or at what speed it is operated. This is another safety feature the value of which was quickly recognized.

We backed our faith in the Tribloc with a guarantee that really protected the purchaser. Not just the usual one-year guarantee “against imperfections in workmanship and materials,” but a guarantee that protects you for years after the purchase.

Evidently we did “hit the nail on the head” when we designed the Ford Tribloc, for our sales increase steadily month by month and year by year. We get repeat orders from all over this country and from many parts of the world. Why? Because we build the Tribloc the best we know how, sell it at a fair price and stand back of it every minute.

Have you our catalogue? If not, we
think you will find it worth having.

Ford Chain Block & Mfg. Co., 139 Oxford St., Philadelphia, Pa.



Insulating Varnishes and Compounds

Superior for all applications of insulating varnish or compound in the manufacture, operation or repair of electrical apparatus.

There is a Sterling product for every purpose. Our engineering department will aid you in the selection of the proper one to solve your particular problem.

Endurance of electrical stress is only one of the requirements which all Sterling insulating products must meet before they leave our hands. Their mechanical and working qualities must all be right, too.

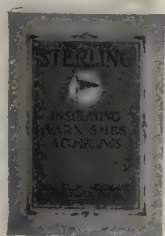
Reliance, absolute reliance, can be placed in all our products. A quarter century employment in the world's electrical equipment assures you of this.

Long life in service is assured by flexibility, pliability, toughness and heat endurance.

Insulating varnishes and compounds receive our undivided attention. We are specialists in their manufacture and use.

No order is too large nor too small. Agents in the larger cities of United States, Canada, Europe, Australia and Japan carry a stock of our products.

Getting your order is not nearly so important to us as giving you complete satisfaction. We desire to serve as well as to sell. If there is any point in the application of insulating varnishes or compounds which is troubling you our engineering department is at your service.



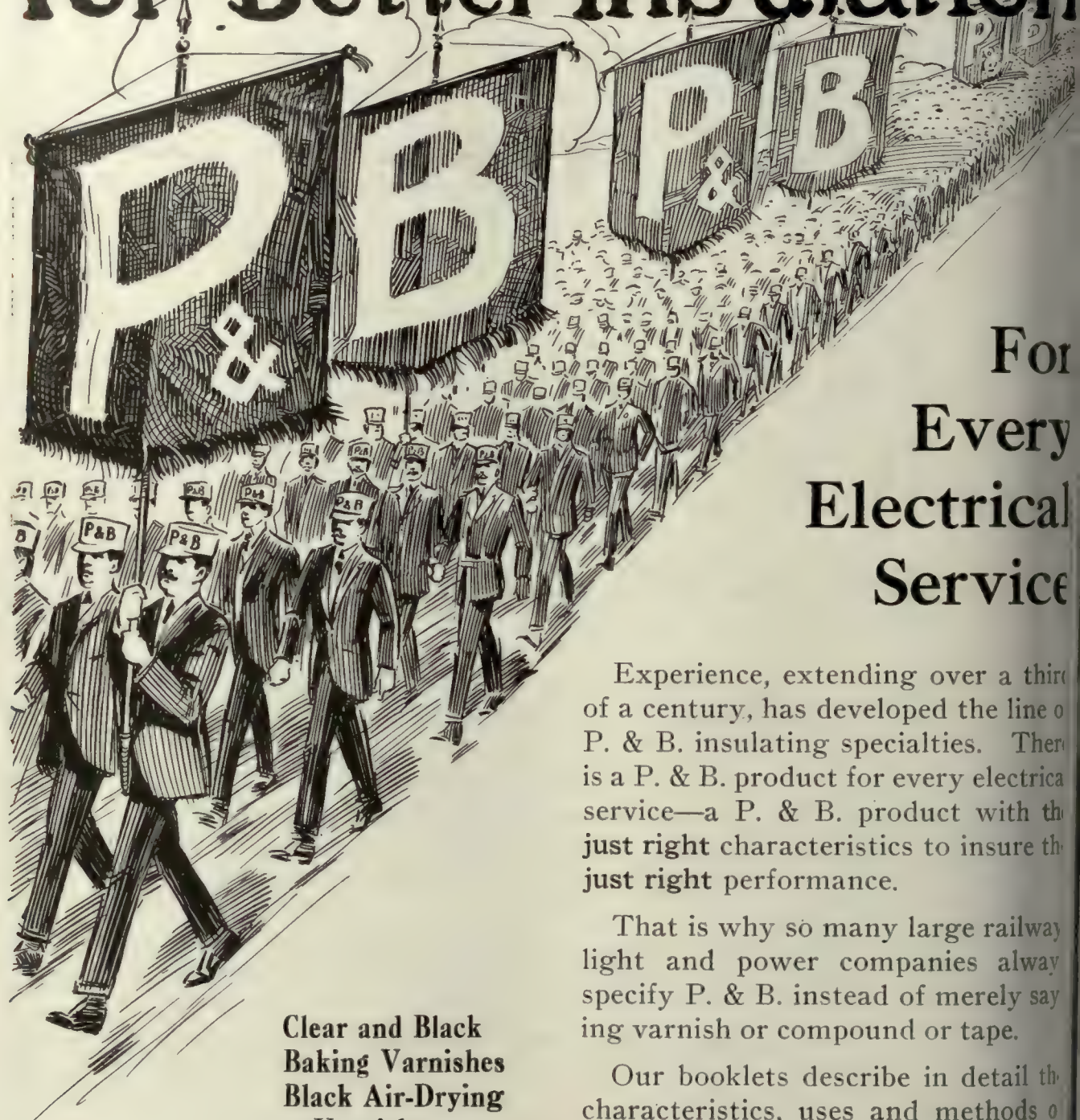
Write for our Catalogue.
It contains information of
value to your maintenance
department.

The Sterling Varnish Co.

Pittsburgh, Pa.
Manchester, England



For Better Insulation



For
Every
Electrical
Service

Experience, extending over a third of a century, has developed the line of P. & B. insulating specialties. There is a P. & B. product for every electrical service—a P. & B. product with the just right characteristics to insure the just right performance.

That is why so many large railway light and power companies always specify P. & B. instead of merely saying varnish or compound or tape.

Our booklets describe in detail the characteristics, uses and methods of application of every P. & B. insulating product. They will help you solve your insulation problems.

Write For Them

Clear and Black
Baking Varnishes
Black Air-Drying
Varnishes
Black Finishing
Varnishes
Electrical Compounds
Insulating Tapes

The Standard Paint Company

Woolworth Building, New York

Boston

Chicago



PERFECT MICANITE INSULATOR

REG. U. S. PAT. OFF.

MICANITE

Commutator, Insulators,
Tubes, Washers, Rings,
Segments, Sheets, Tapes,
etc., made of imported mica.

EMPIRE

Linseed oil treated Cam-
bric, Linen Silk, Canvas
Duck and Papers. High
puncture voltage, long life.

LINOTAPE

Linseed oil coated tape,
both straight and bias cut
for coil winding, cable
splicing bus bars, etc.

KABLAK

Black Varnished Cambric,
Linen, Silk, Canvas, Duck
& Papers, Flexible, efficient
under high temperature.

Insulation For Severe Service

MICO

Untreated insulating fab-
rics, Papers, Fibres, Linen
Tapes, Sleeves, Shellacs,
Cements and Varnishes.

We assume that you buy built-up mica insulation because you wish to utilize the high dielectric strength of mica.

It is well, therefore, to remember that commutator Mica-nite contains 97% to 98% of selected mica films.

On account of the small amount of binding material, Micanite is practically incompressible.

Its density and specific gravity closely approximate that of natural mica and are uniform throughout its structure.

Specify Micanite for severe service and all other service.

For Safe Cable Joints

CONDUCELL

Reg. U. S. Pat. Off.

Makes cable joints as de-
pendable as the cable itself.
Provides uniformly a prede-
termined amount of insulation,
and makes wrapping of each
conductor unnecessary.



CONDULINE

Reg. U. S. Pat. Off.

A special compound devel-
oped for use with Conducell.
Assures dependable cable
joints, free from voids. Vis-
cosity is low enough to pre-
vent cracking, yet high enough
to prevent seepage.

SEND FOR BULLETINS

MICA INSULATOR COMPANY

NEW YORK

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CHICAGO

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Hope Webbing Co.

Manufacturers of

Webbings
Tapes
Braids



Post Office Address: Providence, R. I.
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THIS SHIELD
IS YOUR PROTECTION

IN BUYING TAPES



Look for this shield on the carton.
It is your protection that the tape you
buy is going to prove real insulating
protection to your lines and equip-
ment. We make good tapes for all
trades and purposes, and you know
good tapes are always economical.



*Descriptive literature
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THE MECHANICAL RUBBER CO.



CLEVELAND, OHIO, U. S. A.



Standard Varnish Works

Manufacturers of Well-known

Insulating Materials

Voltalac

Electric Black Finishing Varnish
Standard Black Finishing Varnish
Standard Clear Insulating Varnish
Impregnite for Railway Field Coils

Standard Varnish Company
New York Toronto, Canada Chicago

Some Other Fellow Has Had to Solve the Same Problem

that is puzzling you—and you get the benefit of his experience in your Electric Railway Journal. Consider the Department of “Equipment and Its Maintenance” alone. The rush and drive of work during the day don’t give you time to absorb the dozens of helpful points in every issue. Have a subscription at your home address, and make it

YOUR OWN
Electric Railway Journal

The Comfort and Health of Your Employees is an Important Asset

Don't put all the comforts of your shop overhead. Add a comfortable—and durable—floor to the other features of your shop, car-house, engine room, warehouse, etc. You will find it a profitable investment.

Wood Blocks Make an Ideal Flooring



Barber Non-Bleeding Wood Blocks

make a floor that is wear-resistant, dry and comfortable, never cold and damp.

Dustless
Resilient

Sanitary
Durable

Practically Noiseless
Fire Resistant

A flooring that the heaviest traffic will not injure.

Quickly laid on any solid surface and as quickly repaired, should it ever be necessary, a floor of

Barber Non-Bleeding Wood Blocks will make your shop pleasant and healthful to work in, the movement of heavy objects will be effected with less labor and without injury to floor surface and the periodical annoyance of floor repairs will be cut out.

Correspondence solicited; expert advice on your flooring problems free for the asking.

The Barber Asphalt Paving Company

Works: Maurer, N. J.

Philadelphia, Pa.



No. 501, 5 Amp., 500 V.



No. 501, with dial

“DIAMOND H” SWITCHES For Car Lighting

Characteristics of these switches:

Long switch-blades have wide arc of travel, and give quicker break than the ordinary type.

Sheet mica insulation.

Solid brass binding posts.

Double phosphor-bronze contacts.

Steel used in mechanism is carbonized and drawn in oil—not case-hardened.

The most dependable switch for car-lighting ever manufactured—and up to “Diamond-H” standards in every detail.

No. 501, single pole.

No. 503, three-way.

Write for samples and prices—and let us confer with you regarding your switch equipment for car-lighting and heating.

The Hart Manufacturing Co.
Hartford, Conn.

Section

7

Car and Truck Equipment

THIS section is devoted to the great variety of apparatus and specialties found on the electric car of today. The general classifications alone cover—

Current Collection

Heating, Lighting, Ventilating

Welding

Safety, Efficiency Devices

**Fare Collection and Passenger
Handling Features of the Car**

While a study of each advertisement in detail will reveal the astonishing progress in the development of materials and apparatus for economical and efficient car operation such as flexible non-metallic conduit, plain and anti-friction bearings, roofings, headlinings—in fact

**Almost Everything from the
Trolley Wheel to the Car Wheel**

Prest-O-Lite

PROCESS



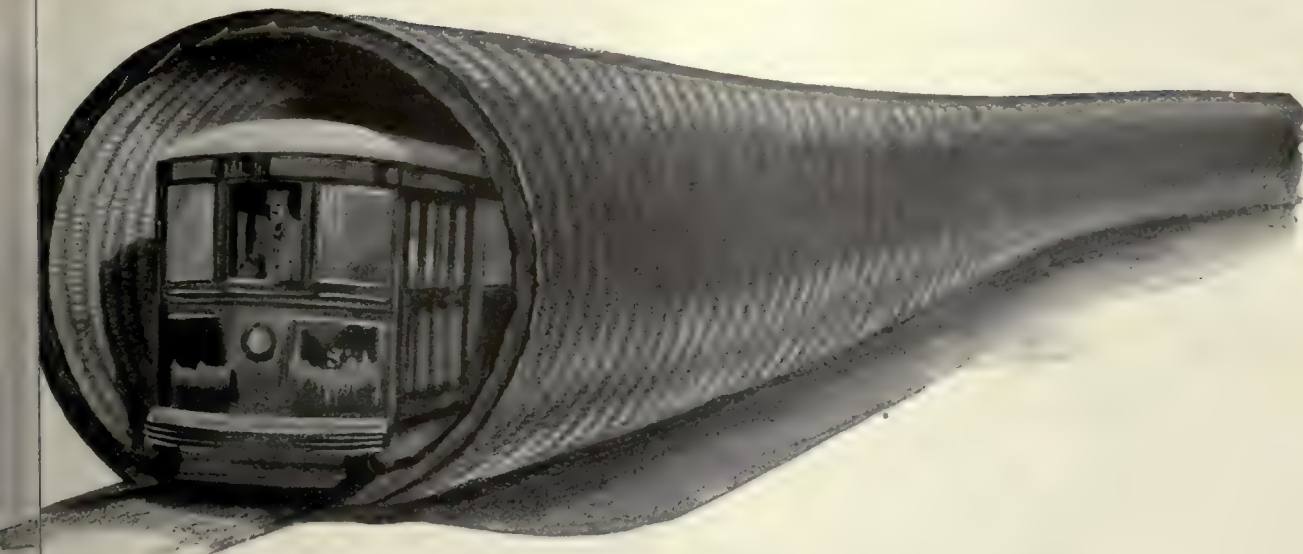
Welding a lug on cast steel motor housing by the Prest-O-Lite Process. Total cost of operation, \$3.70

THE profitable applications to be found for oxy-acetylene welding in electric railway shops, yards and on the track, for repair and construction work, are almost unlimited. This process handles—quickly, efficiently and at low cost—the largest variety of operations, many of which no other process can handle.

For “On the Spot” repairs the Prest-O-Lite welding outfit is ideal. It is perfectly portable and can be rushed to various jobs and repairs quickly effected. Costly delays, expensive dismantling and replacement are often obviated. And this same outfit will effect decided savings in time, labor and material in the manufacture of certain new equipment; also universally employed in the application of Gas-Weld rail bonds.

It will pay you to send for illustrated data today

The Prest-O-Lite Co., Inc., 805 Speedway, Indianapolis



DURADUCT

Reg. U. S. Pat. Off.

The Flexible Non-Metallic Conduit with the Single Wall

Gives You Great Weight Reduction Without Impairing Safety

When you are preparing specifications for those new cars don't forget to call for the use of Duraduct to encase both your main and auxiliary wiring.

When you want to cut off hundreds of pounds of conduit weight in order to add some new specialty, replace metal with Duraduct.

When you want to rehabilitate cars not now fitted with conduit, use Duraduct.

Here Are the Reasons!

No elbows	Non-collapsible	Fireproof
No threading	Tough	Waterproof
Non-raveling	Flexible	Easy to Fish
Non-blistering		Light as a Feather

Sample upon Request

TUBULAR WOVEN FABRIC CO., *Manufacturers, Pawtucket, R. I.*

A. HALL BERRY, General Sales Agent

97 Warren Street, New York 9 So. Clinton Street, Chicago

Distributors for Canada: **NORTHERN ELECTRIC COMPANY, Ltd.**



S A M

Sam-kalpa is the Brahmin for "intensive contemplation."

It is a custom that must preface every religious ceremony.

If the sam-kalpa is performed with due meditation, everything undertaken will succeed—its omission is alone sufficient to transform all ceremonies into acts of sacrilege which will not pass unpunished.

To accomplish a true sam-kalpa the Brahmin must think of nineteen separate, distinct subjects—in regular order and pronounce the names of governing planets. That makes him really think.

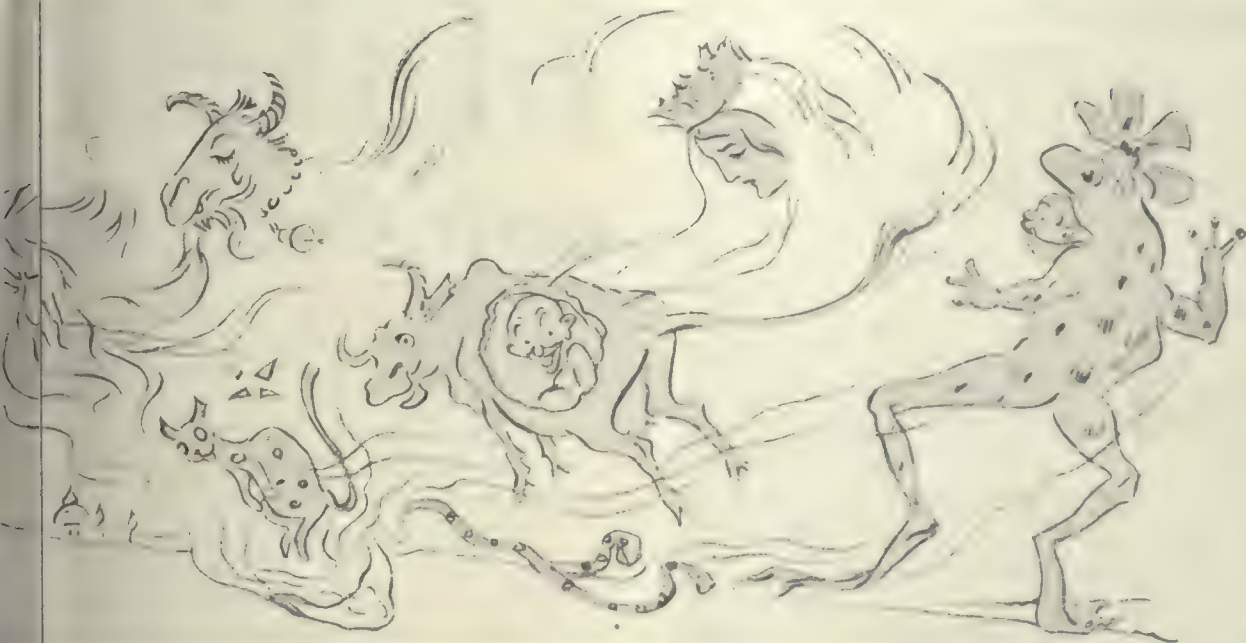
Each subject is a different angle of the one central religious thought. Looked at in a cold business light, the sam-kalpa is a mighty valuable institution.

Don't you see how the consistent thought on nineteen angles of one subject focuses the man's mind so that he can think clear and deep and right to the point?

The Morgan Crucible



120 Liberty Street, New York
Factory, Brooklyn, N. Y.



KALPA

Don't you see how much more constructive his thoughts will prove than those of, say, the railway man who is supposed to **think** right about carbon brushes but

Whose thought runs in about this groove: (1) BRUSH, (2) PRICE, (3) SERVICE.

What a pity he does not think in true Sam-Kalpa form.

There are fully nineteen angles to economical railway motor carbon brush buying and **every single one of them** comes AHEAD of "PRICE."

Fact is that in Morganite brush selling price doesn't enter at all—in its place is **brush cost per car mile**.

This, and eighteen more angles focus on the nub of proper brush consideration.

Together they make up a sam-kalpa you can profitably give intensive contemplation.

Do it.

le Company, Ltd.

ewis Roth Company, 312 Denckla Building
Philadelphia

Electrical Engineering & Mfg. Co.
First National Bank Bldg., Pittsburgh

W. L. Rose Equipment Company
La Salle Bldg., St. Louis, Mo.

Herzog Electric & Engineering Co.
150 Steuart St., San Francisco, Cal.

REGISTERED
MORGANITE
TRADE MARK

Hale & Seat Original

Do you know that Hale & Kilburn have always blazed the way in producing seats of better design, material and mechanism, so that car seating would be a real factor in promoting traffic?

Hale & Kilburn Were the First

To design reversible cross seats for electric city cars.

To design the famous Walkover seat with non-lifting back—still an exclusive feature.

To design a shifting and tilting cushion in order to increase sitting space.

To design correct posture seats for rapid transit service—such as the longitudinal seat of the Hudson Manhattan Railroad, the transverse seat of the New York Municipal Railway Corporation and the circular end seat of the New York State Railways—Rochester Lines.

To use pressed steel framing, including oval pedestal bases drawn in single pieces.

To use bronze or brass backbands instead of wood or leather, insuring longer wear and greater cleanliness.

To use connecting rails of angle iron, T-iron or tubing instead of space-robbing wood.

To make a detachable back as well as the three-part head-roll back for interurban cars.

To make seats for city service with diagonal corner grab handles.

To make interurban seats with single swinging automatic footrests to allow more space under the cushion.

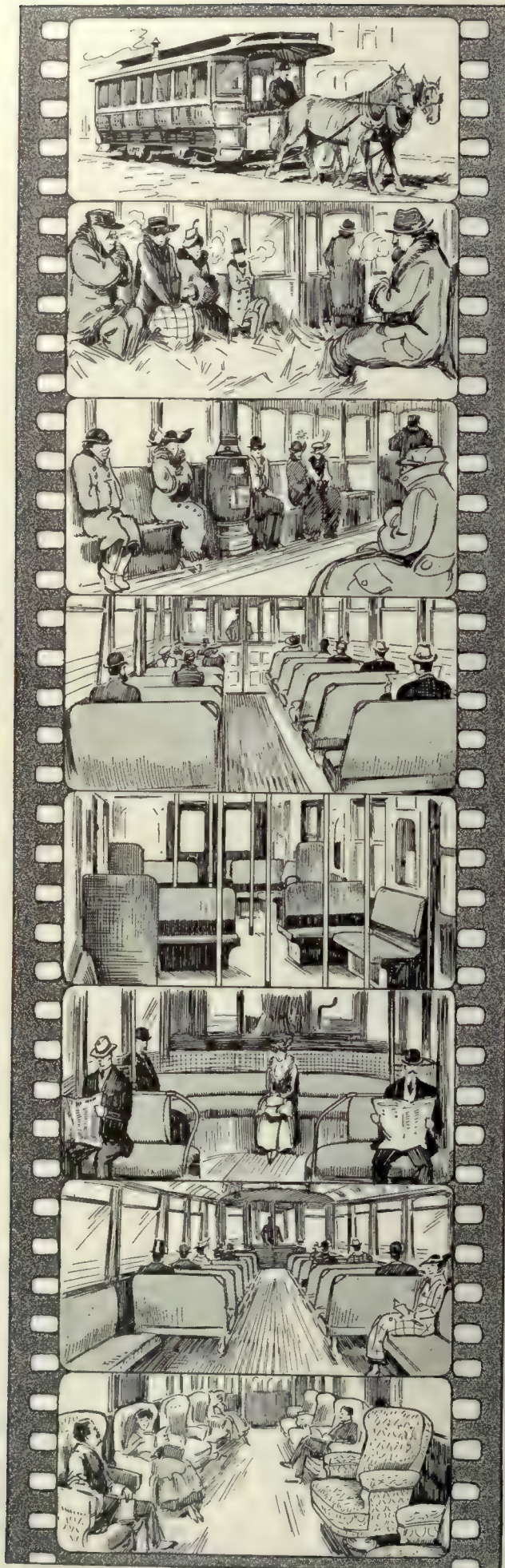


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Philadelphia

Hale and

New York



Kilburn Seat Service

Hale & Kilburn originality has not been the only factor in making Hale & Kilburn seating the standard of the world.

Hale & Kilburn Service, namely, promptness, fair dealing and quality, has been the other great factor.

Hale & Kilburn Service is not a word of "sound and fury, signifying nothing"—but an expression for pleasing the customer first and counting the profit afterward. Here are just two examples of Service:

When one railway asked us to furnish rattan seats for 500 cars in an overwhelmingly short time, Hale & Kilburn put up a \$50,000 building in forty days to make good.

When another railway asked us to furnish both steel interiors and seats in a hurry, Hale & Kilburn decided within five days to erect a five-story building which cost \$120,000 and was ready in eighty days.

Extra patterns, new dies, night work, express shipments—these are a matter of course on any order where time is short.

Hale & Kilburn quality is demonstrated by millions of seats everywhere—in the wonderful New York subway, which has the highest seat-use factor in the world—in the heat of Africa—in the cold of Canada—in classic Athens—in curious Constantinople—in Russia, Italy, France, Portugal, England, Central America, South America, Asia, Australia.

In fact, wherever there is a railroad—electric or steam—there is the seating of Hale & Kilburn.



Company

San Francisco

Washington



International Fare C



INTERNATIONAL SINGLE AND DOUBLE CAR REGISTERS used by tens of thousands on cars where cash, tickets and transfers are registered with cords or rods through the hand or foot.



INTERNATIONAL MONEY-COUNTING FARE BOXES used on prepayment cars in connection with International Single or Double Registers.

INTERNATIONAL COIN AND METAL TICKET-COUNTING FARE BOXES adapted for use on single or double-end prepayment cars.



INTERNATIONAL COIN REGISTERS which receive and count the money with visible and audible overhead registration.

INTERNATIONAL COIN AND TRANSFER REGISTERS which eliminate registers and rods, as both registers are mounted on a column over the fare box, and transfers are registered by a pull-cord.

International Portable Registers, used San Francisco and elsewhere, particularly crowded terminals, by special collectors permit prepayment loading at both ends car simultaneously.

International Motor-Driven Combined Coin and Paper Ticket Registers, which receive both coins and paper tickets in the same hopper, count and return the coins to the conductor for use, separate, perforate and deposit paper tickets in a locked compartment.

International Motor-Driven Station Registers, which supplant the old costly and inefficient combination of ticket selling and ticket chopping. Patrons of elevated and subway lines, ferries and parks soon learn to deposit the proper coin in these boxes, while the railway company eliminates all ticket printing, selling and accounting. These machines are also made to work with turnstiles under the eye of the station cashier where traffic is too light to call for a box attendant.

International Registers and Money-Counting Fare Boxes and Coin Registers are varied to meet local practices as to registration of cash, paper and metal tickets; also as to number of coins acceptable for deposit.

There is an International Fare Mechanism that best meets your needs. If not, we will undertake to make it. Study our line at the Convention, Spaces 602-604, and consult with us there.

The International

15 South Th

ecting Mechanisms

The International Transfer Printer

At this Convention we will display our new transfer-issuing machine, therewith rounding out our equipment to meet any conditions in city fare collection and accounting.

The first International transfer-issuing machine is not a theoretical cure-all, but a practical device made to satisfy the specific conditions set by the customer.

Some of the following features, therefore, are subject to such variations as will meet your needs:

The transfer is printed complete, to avoid obscurity of time and other important figures failing to "justify," that is, to print exactly in the spaces provided for them on partially printed transfers.

The transfer is issued from a roll in the size of 2 in. x 3/4 in. The turn of a crank exposes one transfer and forces down a notched knife, which leaves a 3-16 in. tear-off. Thus the transfer does not fall to the floor, nor can a passenger pull off unprinted paper through the machine.

The transfer supply is uninterrupted. When one roll is exhausted, a second becomes immediately available. This eliminates waste of paper caused by removing partly used rolls, because they would not provide a new supply until the next refilling time.

The machine-made transfer cannot be manipulated because it cannot be timed ahead far enough for changing transfers.

Transfers cannot be issued without the insertion of the conductor's key which unlocks the mechanism.

Simplicity of setting is accomplished by the use of one knob for setting minutes. The hour A.M. and P.M. and the wheels are set automatically by the minute wheel.

One lever for setting the transfer point and direction and a crank for printing and delivering complete the operating control.

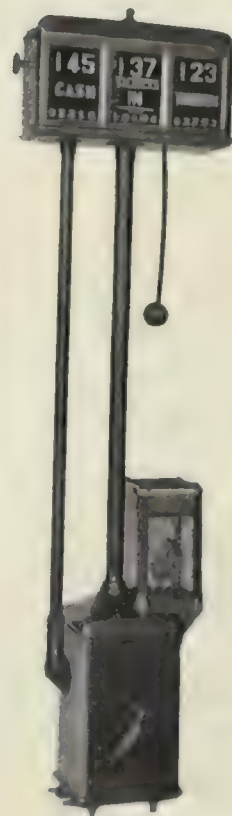
Size 7 x 8 x 3 1/2 inches; weight 17 lbs.

See this Machine at Spaces 602-604, Atlantic City, and write us for full details.

Register Company

et Chicago

INTERNATIONAL COIN, METAL TICKET AND TRANSFER REGISTERS, which receive coins and metal tickets in the same hopper with separate visible and audible registration on overhead dials and having attached a separate hand-operated register for transfers.



INTERNATIONAL MOTOR-DRIVEN COIN REGISTERS, which accelerate fare collection by relieving the conductor of turning the handle of the fare box and by immediate registration and return of money. The Motor-Driven type is recommended for all large cars operated through congested traffic areas.



On Guard at El Paso

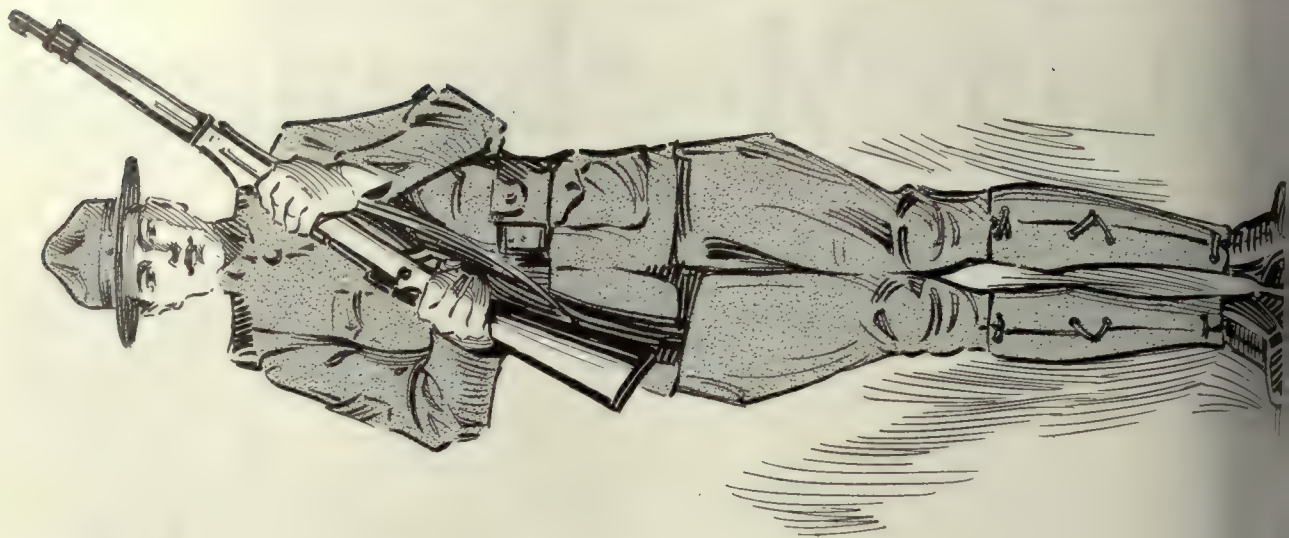
—At Beaumont, Dallas, Houston and Fort Worth
—at Tacoma, Seattle, Jacksonville, Savannah and on practically all the Stone & Webster properties;

On the United Railways of St. Louis—the Public Service Railway of N. J.—the Third Avenue Railway of New York—The Connecticut Co.—the New York State Railways—at New Orleans—Memphis—Little Rock—Omaha—in fact, on nearly all the progressive lines throughout the country, you will find the

Johnson Registering Fare Box

What led the management of these roads to select the Johnson Fare Box?

Nothing on earth but inherent superiority—for the Johnson is the one fare box which can be absolutely relied



A Century for

Your Treasury —it counts and registers both COINS and TICKETS

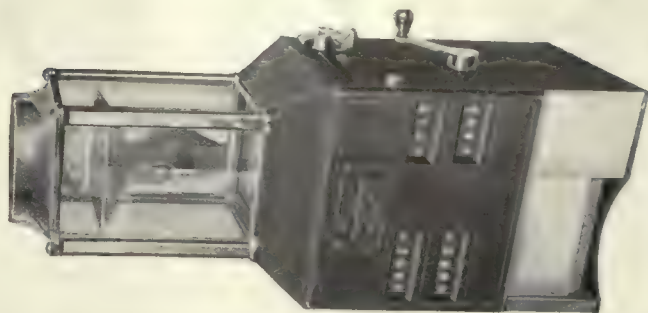
It materially increases fare receipts—divides the total passenger load into the three classes of fares collected—cash, tickets and transfers—makes it impossible to substitute one class of fare for another—gives a totalized registration of all cash and ticket fares on totalizing dial, registering metal tickets on a separate ticket dial.

Metal tickets used with the Johnson Fare Box are so designed as to prevent counterfeiting, and tickets are sold and resold on the car by the conductor. The big expense of printing and counting paper tickets is eliminated.

Wherever installed, the Johnson Fare Box has not only stopped all fare-collection leaks, but has also won the favor of both passenger and conductor, and accelerated schedules. Be sure to see our exhibit while you are at the Convention—Space 621.

For Cash Fares

*Interesting details
are in the new booklet—Write for your
copy*



FOUR-DIAL FARE BOX

For Cash Fares and
Tickets

Johnson Fare Box Company

Jackson Blvd. and Robey St.
CHICAGO, ILL.

REPRESENTATIVES:

U. S. Metal & Mfg. Co., New York
Grayson Railway Supply Co., St. Louis
H. F. Keegan Company, Chicago
S. I. Wailes, Los Angeles
P. F. Bodler, San Francisco

ROOKE

TO THINK STRAIGHT on this fare collection problem you must either agree or disagree with us on two basic considerations, i e.,—

(a) **THE INITIATIVE IN FARE PAYMENT** should not be left to the passenger;

(b) **THE INITIATIVE IN REGISTRATION** should not be left to the conductor.

Generally speaking, passengers will not seek out your conductor or some mute, open-hopper fare box. Collections should not be made on the wait-on-yourself, cafeteria basis. Passengers instinctively expect to be and should be singled out and served. The registering device should be conveniently brought to the passenger. The passenger, not the conductor, should operate this register. The register to serve that simple but fundamentally sound idea must be small, portable, and have unusual mechanical functions. Did you ever try a ROOKE register and note its human-like zeal in

reaching for, gripping and instantly registering the coin you but slightly insert into it? It is alive, and not a dead gravity-operated device.

No matter what type of car is used the fixed-point idea tends to make a door-man of your conductor. It kills his initiative. He no longer goes after fares and feels responsible. The mute box is imposed upon and avoided. The conductor has lost that vital thing, collection control.

The principle of leaving the registration of fares optional with the conductor has firmly established its own bad record. No problem at all, if that method were fast to either the conductor or his employers. It simply means temptations, suspicions, known losses, guess-work and trouble-breeding in all your working relationship. **THE CONDUCTOR SHOULD COLLECT. THE PASSENGER SHOULD REGISTER.**



"The man *behind* the conductor's hand should supply *initiative* in fare collection. The ROOKE register in that hand *speeds up* even the passenger who is *ready*, while converting *both conductor and passenger initiative* into a record that cannot be *shirked or falsified*."



Point 1—Adaptability.—The ROOKE register is just as adaptable to pre-payment as to inside-payment or pay-as-you-leave cars.

To center-entrance cars as to end-entrance cars.

To single-zone as to many-zone runs.

To single cars as to two-car trains.

To short platforms as to long ones.

To big cities as to smaller ones.

It fits in wonderfully well to **standardize** with.

It is not merely a nickel register, a dime register, a quarter register, or a tick register.

It may be either, or a combination of several, **designed to fit your conditions.**

Point 2—Portability.—Omit comparisons with old-style portables. The ROOKE is entirely different. It **must** be portable to get results.

It gives the conductor absolute **collection control**. Anywhere he goes or extends his hand, the register can be on the job to interpose and secure **instantaneous** collection registration, bell and cash delivery.

Instead of making the conductor one-handed, it extends the conductor's reach, convenience and increases speed. It weighs but 21 oz. It collects at both ends of the car or permits of street collection. No transfer of equipment. No cumbersome "clock" to carry if you have a break in the line. No winding up each trip. No climbing in and out of cars to take readings. The conductor watches the step and serves passengers without losing collection-control. No fares rung up by excited passengers.



Point 3—Speed.—As speedy as the hand of the conductor, because it actually becomes a part of his hand, darted hither and thither wherever there is a fare in sight. It emphasizes the nickel. Less change-making is necessary. There is no later act of registration, with its attendant jostling of passengers or possible bunching of fares and substitution losses. When your conductor gets to the passenger the deal is over. No time given to ringing up or reaching for overhead cords or rods. The rule against "bunching" is no longer broken. Impossible.

Adequate speed on pre-payment and all other types of cars in meeting all collecting contingencies in large cities is not guess-work or theory. **THIS RECORD IS ESTABLISHED.**



Point 4—Simplicity.—The conductor is relieved of handling a lot of fare registering mechanism. No disputes with others regarding readings.

Forms of fare which simply represent statistics are quickly handled on that basis. The most direct possible auditing.

ROOKE registers are easily and safely handled in your accounting office. In no sense burdensome to the conductor. Most flexible as regards any method of handling to cover non-essentials, and **absolutely certain and positive in essentials.**

Rooke Automatic Register

MERITS

The ROOKE register is in a class by itself as a fare collecting device and method **adaptable to all car types**. It utilizes the initiative of the conductor in **going after fares** on the pre-payment platform. It brings to your **bus cars, interurban or summer cars** the same uniform efficiency. It strips the conductor of all initiative and opinion in the matter of registering fares. **The simple fact of collection insures correct registration.**

The ROOKE register is **man-equipment**, not car equipment. The register is handily brought to the passenger and **operated by the passenger.**

With the ROOKE register it is impossible to "bunch" collections or registrations. It is impossible to work substitution schemes between fare values. Your con-

ductor can neither be "over" nor "short," and his integrity is protected against unjust suspicions.

The work of a conductor equipped with a ROOKE register is absolutely **IN THE OPEN**. THERE ARE NO TWO MEANINGS OR EXPLANATIONS FOR WHAT YOU SEE OR WHAT HE DOES. He simply **COLLECTS**. REGISTRATION CARES FOR ITSELF AUTOMATICALLY.

The ROOKE register thus becomes a **part of the conductor, a part of the passenger, and a part of the company**. These three factors get together the instant of fare payment. **THAT INSTANT IS THE ONLY PSYCHOLOGICAL MOMENT.** The transaction is always on the basis of (1st) the passenger, then (2nd) the company, then (3rd) the conductor.

The ROOKE automatic register is the only modern fare collection device that enables you to combine the registering accuracy of an automatic mechanism with the initiative, the experience and skill of the conductor."

Point 5—Popularity.—Passengers are keenly interested in the human-like action of the ROOKE register. Its business-like grip and "tug" on the coin is a feature which causes the passenger instinctively to **know** that the company gets the nickel. No nasty emphasis on the idea that the conductor is not trusted. It is not a box. Conductor gets the money instantly. Passengers realize that a business transaction has been instantly audited in an extremely simple manner.

The passenger's accustomed physical act of payment is not much changed. It is simply **utilized**. The passenger knows there are newer and better ways of paying fares than by dropping the money into the conductor's hand.

With the conductor relieved from mental accounting and the later physical work of reaching for and operating the old overhead register hundreds of times each day, the passenger recognizes an accomplishment and **co-operates**. **THE COMPANY IS COMMENDED RATHER THAN CRITICISED.**

Point 6—Economy.—You are not asked to invest one dollar in equipment, or send one cent in changing car entrances or interiors, in order to adopt the ROOKE register on **all your cars**. The ROOKE register comes on the **must-make-good** basis.

ROOKE registers are rented. You are more interested in financial results than in the ownership, repair and later dis-use of fare boxes or overhead registers with their transmission cords, rods and accessories.

AT AN EXPENSE OF LESS THAN ONE CASH FARE EACH DAY FOR EACH OF THE TWO CONDUCTORS OPERATING ANY ONE OF YOUR CARS, you may adopt the ROOKE SYSTEM. The ROOKE register will eliminate at least 90% of your present losses.

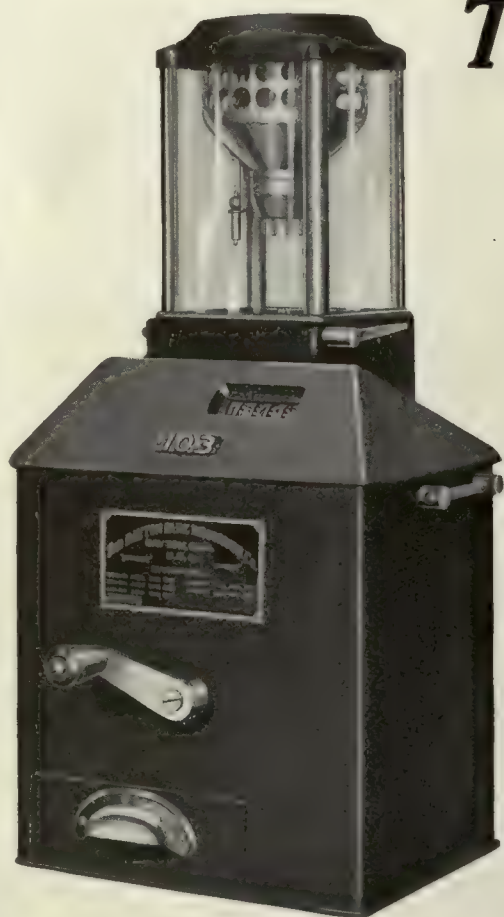
Point 7—Seniority.—All sorts of fare collecting devices have been booted into the scrap pile since the ROOKE register was born. The ROOKE SYSTEM makes new friends each year, and holds its old friends. It was the first coin-operated register, and is the first and only register operated without the use of hoppers or their auxiliaries to delay or defeat automatic registration. It is the only register providing **instantaneous registration by the passenger**. It was the first coin-operated register to use and classify metal tickets representing different fare values, etc., etc.

Mr. MANAGER: You are not using ROOKE registers for **FEAR OF THINGS THAT WON'T HAPPEN**. Features of friction you fear are **all obviated** through our co-operation at time of installation. The things you fear may happen, **WON'T HAPPEN**. The advantages you desire **WILL MOST CERTAINLY BE REALIZED**.

er Co., Providence, R. I.



Get All Fares The Dayton Way



The Dayton Registering Fare Box

Is the Most Accurate and
Reliable Registering Fare
Box on the Market.

The Dayton Fare Recorder

Produces a Complete
Printed Statement of
Passenger Earnings
and
Traffic Data—
Classified—
Summarized and
Totalized.



The Dayton Fare Recorder Co.

Dayton, Ohio, U. S. A.

Put a Safety Deposit Box on Every Car

You keep your valuables in a safety deposit box in a vault most likely. You do it for protection.

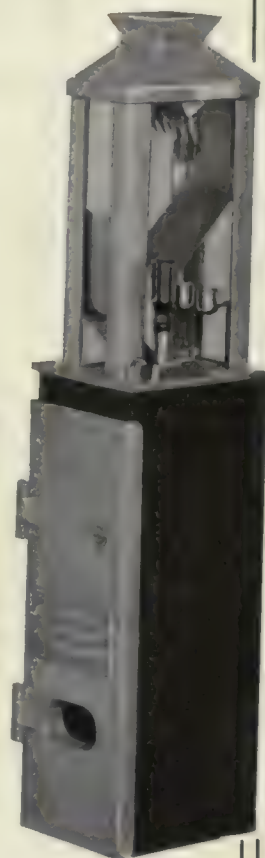
Fares are the most important valuables of a railway. Why should you let employees carry them around in their pockets? Stop many little losses and you greatly increase profits.

Cleveland Fare Boxes



are as safe as a bank vault. Once the coin or ticket is deposited in the box it cannot be removed until your authorized representative removes it. Mutilated coins will not damage the Cleveland box because there are no intricate working parts.

These locked fare boxes are made in sizes and types to meet every condition found in collecting fares.



Use These Boxes on your One-Man Cars

Whatever your requirements, we can meet them. We make special fare collection apparatus for special conditions.

Cleveland Fare Box Company

5318 St. Clair Avenue, CLEVELAND, OHIO

THE OHMER SYSTEM

Our service meets every fare protection requirement, whether for city, suburban, interurban, pay-as-you-enter, pay-within, one-man or two-man car operation, toll bridges, ferry boats or park entrances. The

flexibility of the Ohmer System and its adaptability to all conditions account in part for its increasing use. The main reasons for its success, however, are because—

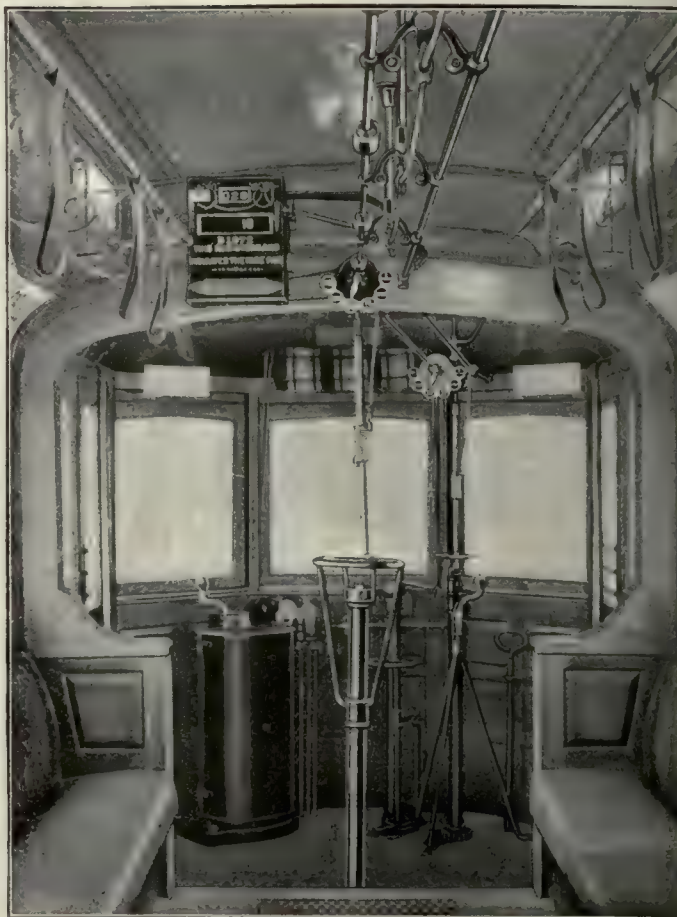
It gets the fares.

It gives the management a clear insight into the characteristics of the men.

It promotes competitive efficiency.

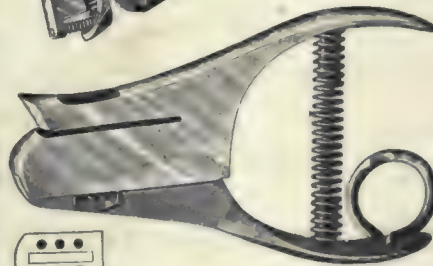
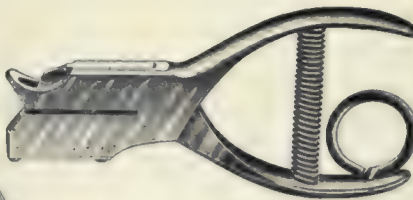
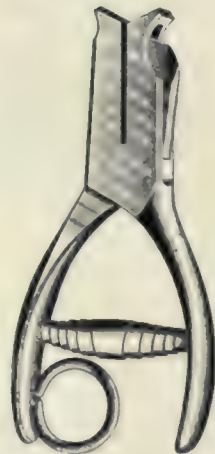
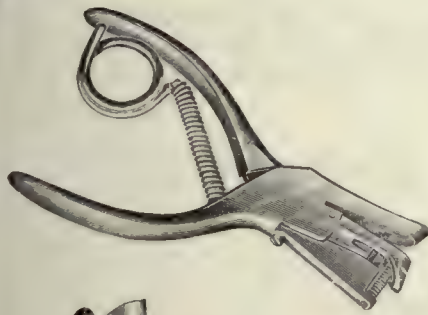
It is based upon correct business principles.

The use of the Ohmer Fare Register opens up to the progressive manager certain very practical possibilities for the betterment of his business. The Ohmer System is the complete working out of those possibilities. Let us explain how it applies to your particular conditions.



An Ohmer Operating equipment adapted to either pay-within, pay-as-you-enter, one-man or two-man operation.

OHMER FARE REGISTER COMPANY, DAYTON, OHIO



CHICAGO
WYOMING
GLENDALE
HAMILTON
MIDDLETOWN
CARLSLE
BANKSBURG
DAYTON
COLUMBUS

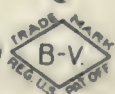


B-V Ticket Punches

Have been adopted as
Standard on the leading
electric railways and steam
roads in the United States
and foreign countries.

Send for Catalog.

BONNEY-VEHSLAGE TOOL CO.
124 Chambers St., New York
Factory, Newark, N. J.



HEYWOOD-WAKEFIELD

The Lightest Seat Ever Built



for real service, with a full measure of comfort and of a construction that is easily repaired at a low cost, is shown herewith.

We specialize in reversible seats and in high grade car seating of all kinds.



A glance at this picture will indicate the value of the lifting cushion.

The upholstered spring cushion and back may be had in the same type if preferred.

We are just equipping a lot of cars with our Number 6C for the Omaha & Council Bluffs Street Railway Company.



Heywood Brothers and Wakefield Company
WAKEFIELD, MASS.

New York

Boston

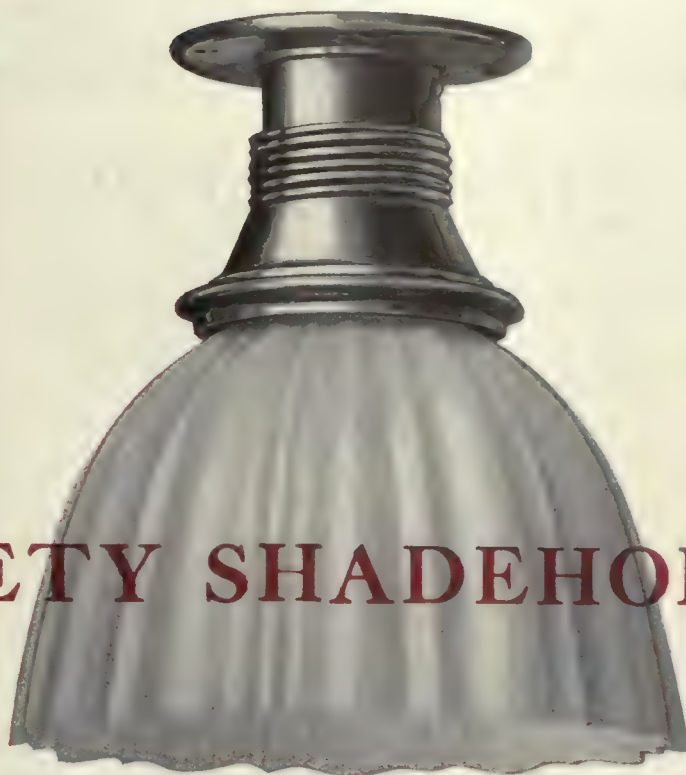
Richmond

Chicago

Los Angeles

San Francisco

Portland, Ore.



SAFETY SHADEHOLDER

150,000 Safety Shadeholders are now holding reflectors on passenger cars in service runs.

When a traction company replaces its old carbon car lighting lamps with Mazda lamps, reflectors and Safety Shadeholders it earns over 50% on the investment, and repeat orders follow.

One large traction company operating in a western city recently ordered nearly 8000 of these shadeholders to equip all of its cars after a service trial on three cars. This goes to show that the popularity of this shadeholder is founded on service facts—not on paper claims.

The Safety Car Heating & Lighting Co.

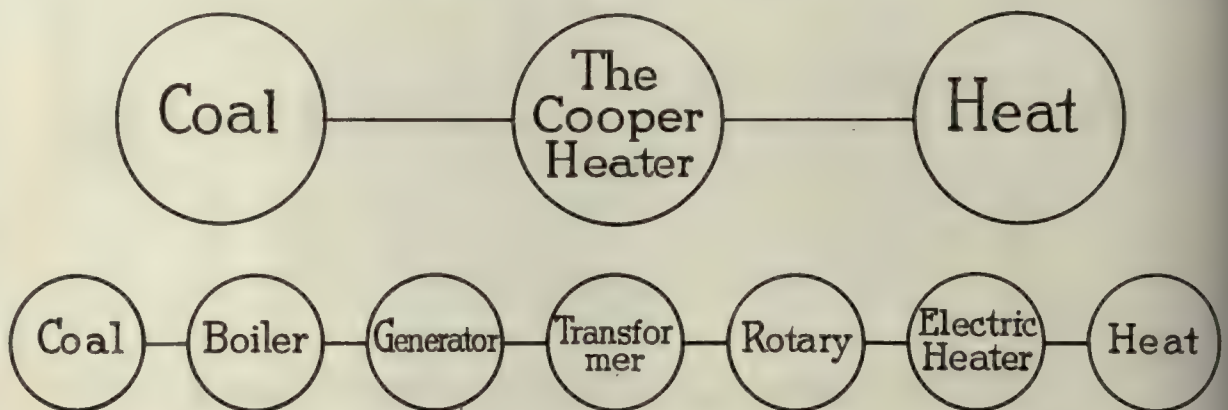
Chicago
Montreal
San Francisco

2 Rector Street, New York

Philadelphia
St. Louis
Boston

Electric Service Supplies Co., Philadelphia, New York, Chicago, Agent

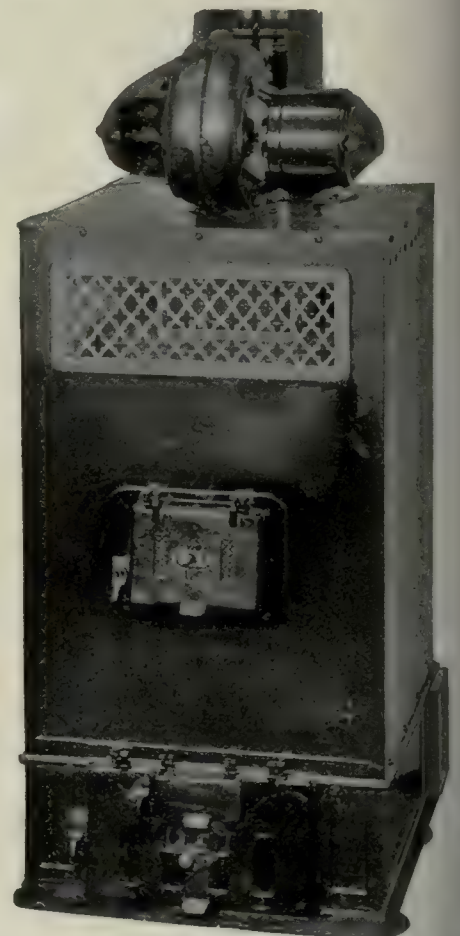
A Demonstration of the Economy of **THE COOPER** Forced Ventilation Hot Air **HEATER**



Look at the above diagrams. The economy of a Cooper Heater must be apparent from them for from coal to heat is a direct process—with a Cooper Heater—one economical step.

With an electric heater the coal must pass through many steps before it is available as heat in the car. Every successive stage in the operation enters an economic loss. If you realized what this loss means to you in cold cash you would investigate the Cooper Heater without delay. Some actual cost comparison figures are yours for the asking.

The Cooper Heater Co.
Carlisle, Pa.



ELECTRIC HEATERS



THERMOSTATIC CONTROL

VENTILATORS



VENTILATED PORCELAIN, CORE
(Note Perforations)

Permitting a free passage of Air through the Coil

ORIGINATORS
of the

Ventilated
Porcelain Core

Its general use has
proven its value

ORIGINATORS

of the use of

Non-Corrosive
Resistance Wire
in Electric
Car Heaters

When we adopted the use of a positively non-corrosive resistance wire as standard in our electric car heaters some seven years ago, we felt sure we had found a wire that would stand up under all conditions and in any climate. Time has proven its great value in the electric heater field. Its adoption as standard by many railroads has proven its worth.

GOLD'S ELECTRIC HEATERS

Made for Service—Not Made to Fit a Price and Impracticable Weight

In the construction of our heaters we place the coils in such a position as to give perfect circulation. The case or front perforations are distributed so as to eliminate all possible heat pockets. The metal used is high grade, free from scale, admitting of a lasting finish. Our heaters have stood a break-down test of over 5000 volts, showing their perfect insulation.



Installation of
Deflector Cross Seat Heater

Our Deflector Cross Seat Heater illustrated is a radical departure from the older type Cross Seat Heaters, no extra hangers being necessary. The heater flanges themselves rest on the seat rails and are secured to them by four bolts. The cover or top of heater is secured to the heater case by the same bolts, thus forming a heat deflector, preventing the pocketing of heat under the seat cushion.

About 20,000 HEATERS furnished to railways in Greater New York during last season

GOLD'S THERMOSTATIC CONTROL

Saves Over 50% in Current Consumption

The economy exercised by the use of Thermostatic Control is evidenced by the fact that many roads are making it a standard. Gold's Thermostatic Control is positively vibration proof and extremely sensitive to temperature changes. Our main control switch is constructed to handle any amperage employed in the electric heater service.

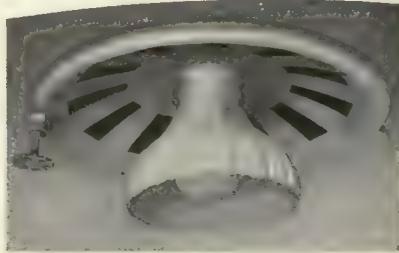
GOLD'S VENTILATORS

SCIENTIFICALLY CORRECT. CAN
BE LEFT OPEN AT ALL TIMES

GOLD CAR HEATING & LIGHTING CO., 17 BATTERY PLACE
NEW YORK

"DAYTON" FIXTURES

MAKE STANDARD CARS



No. 173

One Light Electric Pendant
and Ventilator Register (Pat-
ented).

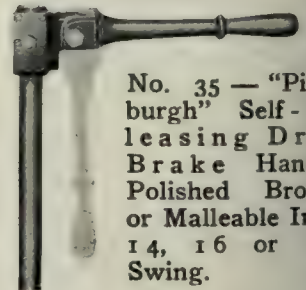


No. 183—Sash Lock and
Anti-Rattler.

No. 75—Pressed Steel Sash
Stop (Cut $\frac{1}{2}$ Size)



No. 1583-A—Pressed Steel
Headlight with $8\frac{3}{8}$ " Sema-
phore Lens and Enameled
Reflector Body.



No. 35 — "Pitts-
burgh" Self - Re-
leasing Drop
Brake Handle,
Polished Bronze
or Malleable Iron,
14, 16 or 18"
Swing.

For more than thirty years we have been developing and improv-
ing Interior Equipment and Fittings for Electric Railway Cars.

"Dayton" Trimmings are standard on the largest roads.

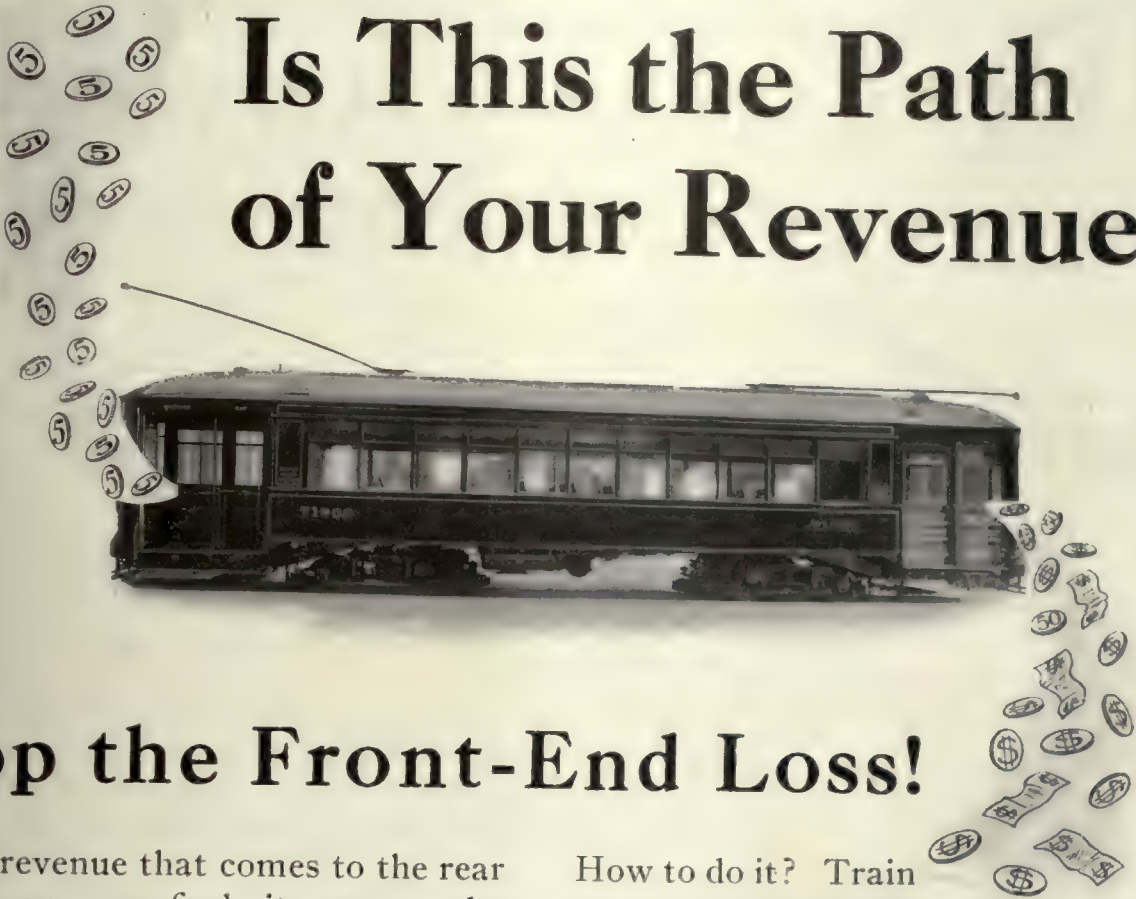
Lighting Fixtures
Basket Racks
Sash Trimmings
Window Curtains
Brake Handles

Headlights
Washstands
Water and Dry Closets
Platform and Vestibule Trimmings
Solid Bronze and Brass Car Hardware
for any use.

Specify "Dayton" Material and be Satisfied.

THE DAYTON MANUFACTURING CO.
DAYTON, OHIO

Is This the Path of Your Revenue?



Stop the Front-End Loss!

All the revenue that comes to the rear end of your cars finds its way to the company's finances. Registering devices, fare boxes and careful training of conductors aim to secure 10% efficiency.

But there's a leak at the front end. Not in actual dollars and cents, but in factors that can be measured in dollars and cents. Poor schedules, wear-and-tear on equipment, comfort of passengers—all are dependent on the efficiency of your motorman. Raise his efficiency and you stop the leak.

How to do it? Train your motormen in the proper handling of the equipment they control. Teach them its possibilities and limitations. Employ Economy Meters to measure their efficiencies just as you use fare boxes or registers to keep check on your conductors. An Economy Meter on a car gives the motorman a check on himself and tells

you just how efficient he is. Many railway systems are getting big results from Economy Meters and Economy Methods. Let us tell you about them.

ECONOMY
BUILT LIKE A WATCH
METERS

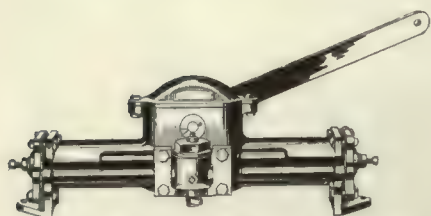
Sangamo Electric Company

Springfield, Illinois

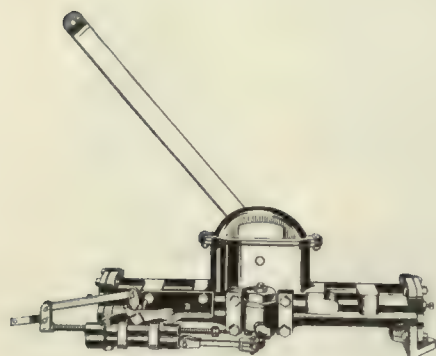
Specialists in Meters for Every Electrical Need



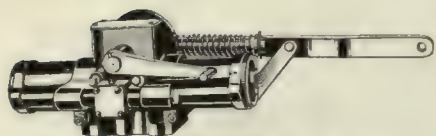
National Door and Step Control Is Now Widespread in All Classes of Electric Railway Service



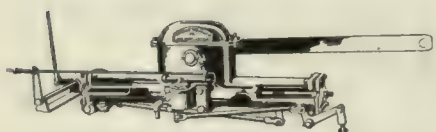
Type G-M 2 5/8 x 6, as used in Detroit and Toledo



Type G-M 2 5/8 x 8, as used in Chicago and Boston



Type G-E-L 3 x 4 1/2, New York Municipal Railway Corporation



The G-M 2 5/8 x 10, Interborough Rapid Transit Company, New York

More than a decade ago this company began the manufacture of door and step control that would reduce platform accidents, improve fare collection and increase schedule speed.

To a large degree these ends have been attained by National Manual control; and to a still larger degree, particularly for short-headway service, by National Pneumatic control.

Today National Pneumatic equipments are used by the thousands—not only on the great rapid transit lines of Boston, New York, Brooklyn, Newark, Philadelphia, Chicago, Pasadena, Vancouver—even to Australia—

But also in every class of surface transportation—for the articulated and center-entrance cars of Boston, the stepless cars of New York, the pay-leave motor cars of Cleveland, the trailers of Detroit.

The engines sketched here are but a few of our widely-used designs.

All have made good in the essentials of low maintenance, positive action and negligible air consumption.

If you're at the Convention come to our live exhibit in spaces 12-14-16. If you're at home, ask us to come to you.

NATIONAL PNEUMATIC COMPANY

50 Church St. New York

515 Laflin St. Chicago



National Interlocking Safety Door Control Is Reducing Accidents, Maintenance and Running Time



The grab handle, the stanchion and the rail were the first safety devices.

Then came door and step control—both manual and pneumatic.

Next in order was the light signal to indicate to the motorman that all doors were closed.

But perfect safety arrived only with National Interlocking Safety Door Control, which starts the car automatically from the first notch of the controller as all the doors are closed.

More than a thousand cars have already been equipped with National Interlocking Safety Door Control for New York, New Haven, Boston, Albany, Erie and other cities.

This wonderful invention has cut car standing time so appreciably that the schedule speed has been raised more than 10 per cent; it has eliminated the bell signal; it has practically abolished boarding and alighting accidents and it has reduced controller abuse and trouble to the minimum.

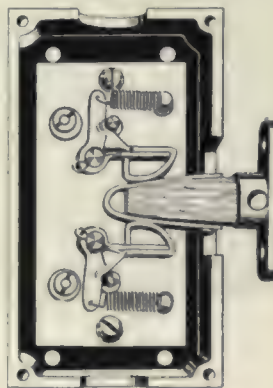
We have these facts directly from operation. Don't fail to provide this combination of Safety, Speed and Economy for your present and coming rolling stock.



Motorman's Light Signal



K-Controller with Interlocking-Door Control



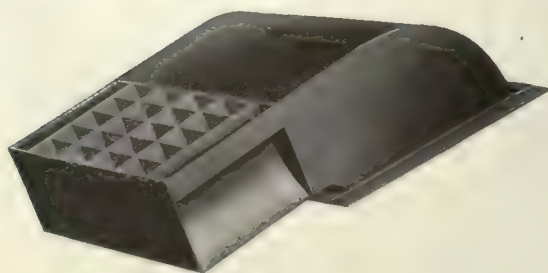
Style E Door Switch and Contact

NATIONAL PNEUMATIC COMPANY

50 Church St. New York



515 Laflin St. Chicago



Garland

Make your passengers comfortable in well ventilated cars. The fact that more Garland ventilators are in use today on railway cars than all other ventilating devices combined indicates their superior efficiency.

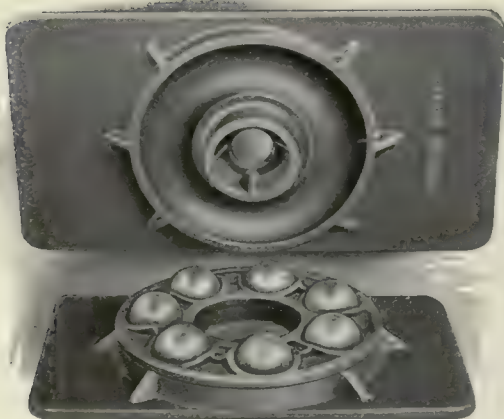
Service and laboratory tests prove that Garland ventilators pull the greatest amount of foul air from a car body. This is why they are so extensively used on sleeping, private, city and interurban cars.



Wasson

The Wasson Air Retrieving Trolley base prevents expensive damage to overhead caused by wild trolley poles. In case of dewirement the base forces the pole to the roof, cushions it to prevent puncturing the roof and locks it against lateral swing.

This base positively retrieves whether the pole is held by a rope or not. A sudden upward motion causes it to operate instantly. It can be placed on any car having air brakes.



Perry-Hartman

Reduce your wheel flange wear, rail wear and power consumption by using Perry Hartman side bearings and center plates. They give you an anti-friction free-radial self-centering truck at minimum initial cost.

These bearings prevent binding between truck and body bolsters, thus decreasing danger of wheel climbing and derailments. Over 200,000 car equipments are now in satisfactory service under heavy cars.

U. S. Metal & Mfg. Company, New York
Brown & Hall Supply Company, St. Louis
C. F. Saenger & Company, Cleveland
C. E. A. Carr, Toronto
Alfred Connor, Denver

We Exhibit At

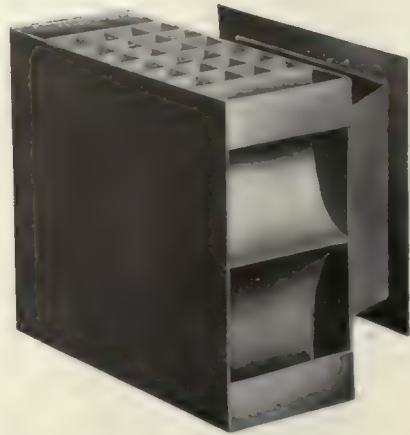
Holder

1508 Fisher Building

Ventilators

They are produced in several models for various classes of service. We illustrate here two honeycomb types for arch and monitor roof. They are absolutely storm proof and will not admit side winds or rain. They can be easily installed on old cars, attached to deck sash.

Full description of ventilators and ventilating systems in new Garland catalogue. Send for copy **today** or see full size ventilators and get catalogue at the Convention.



Bases

We announce here the **Wasson City Type Non-Retrieving** base. Railroads which purchased the air-retrieving base found it so superior as a base itself that a definite demand arose for a similar base for cars without air brakes.

Both bases offer distinct advantages, such as uniform tension on wire regardless of height, roller bearings, superior current collection, better wiring through special work. Both bases displayed at Atlantic City.



Bearings

Perry roller bearing side bearings have ten small rollers in each main roller and are entirely anti-friction. Hartman center plates have seven balls, each $2\frac{1}{8}$ inches in diameter and carry car weight on entire surface.

They do not pit, require no lubrication, have nothing to wear out and by their self-centering action reduce wear and give an easy riding car. See these at the Convention installed on full-size truck and body bolsters.

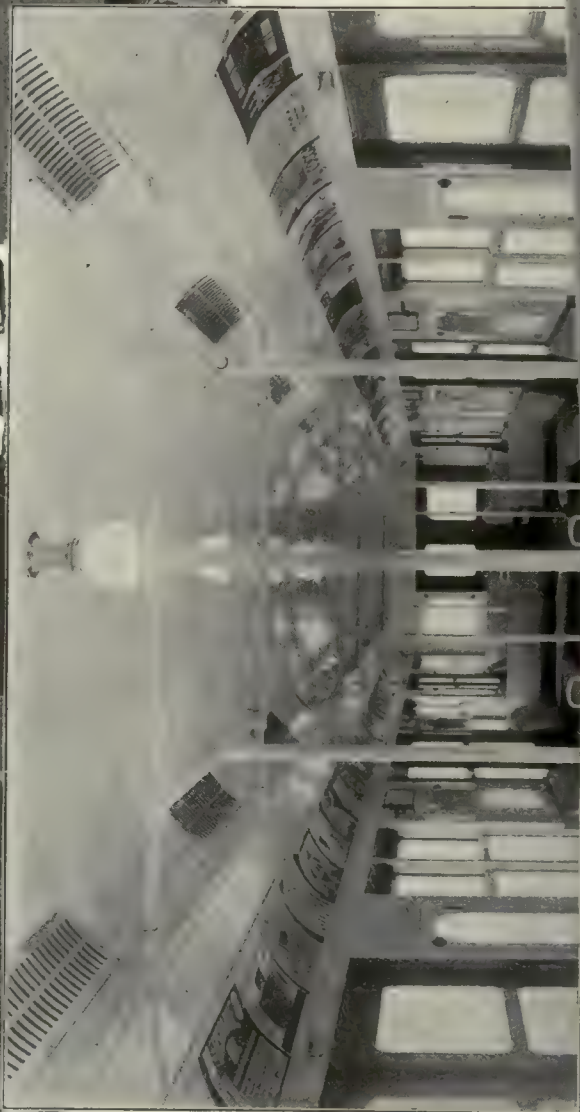


Atlantic City

White

Chicago, Illinois

W. M. McClintock, St. Paul
W. F. McKenney, Portland, Ore.
S. I. Wailes, Los Angeles
F. F. Bodler, San Francisco
O. H. Davidson Equipment Co., Salt Lake City



Perry Ventilators
have been
Standard for
15 years on the
leading Electric
Railways of
America

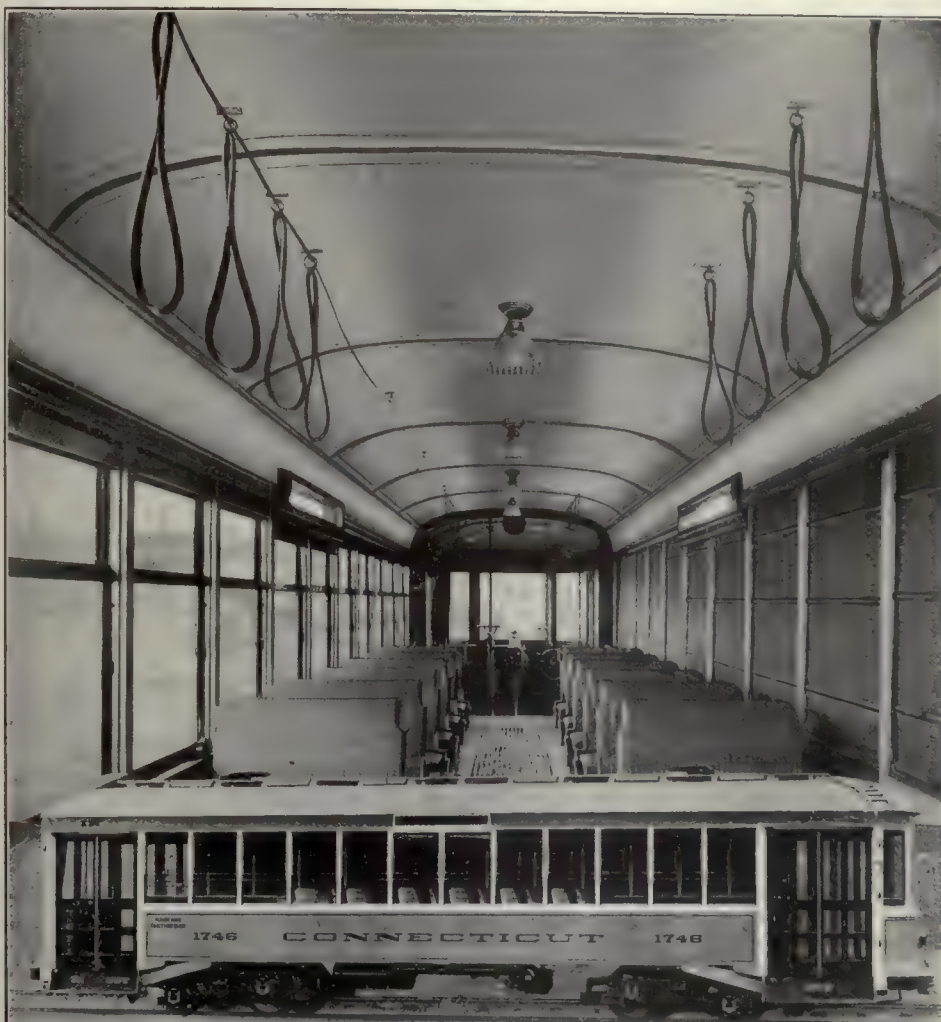
The 12 registers shown on each side of interior view New York Municipal Railway car are all controlled by a single lever—invisible mechanism.
Write for particulars.

Perry Ventilator Co.

New Bedford, Mass.

Sales Manager, F. C. Stowell
200 Devonshire Street, Boston





NEVASPLIT HEADLINING

Installed on forty-six cars just delivered by the Osgood-Bradley Car Co., Worcester, Mass., to the Connecticut Company. Nevasplit headlining was chosen because it is waterproof, non-warping, non-peeling, non-fading, sightly, durable and economical.

THE Keyes Products Company

EQUITABLE BUILDING, 120 BROADWAY, NEW YORK

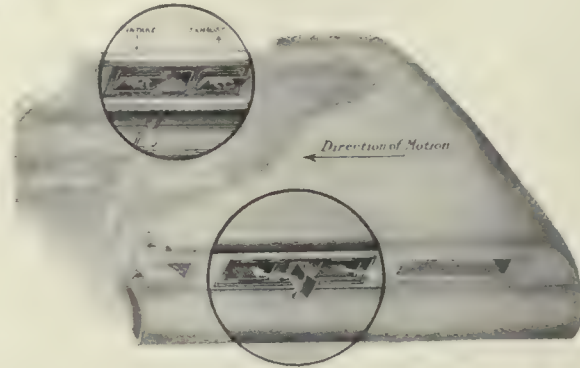
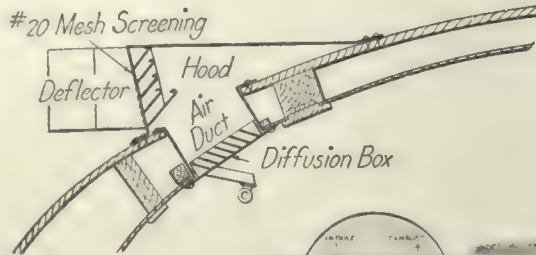
New York
W. R. Kerschner Co., Inc., 50 Church St.

Chicago
J. E. Simons, Fisher Bldg.

San Francisco, Cal.
D. E. Ford, Merchants Exchange Bldg.

Washington, D.C.
R. H. Pilson, Munsey Bldg.

CAR VENTILATION OF EVERY AT ALL



Automatic
2 Rector

"INTAKE-AND-EXHAUST" TYPE:

PRICES: \$3.00 to \$10.00 per set.

The "Automatic" provides a powerful "Exhaust" for the withdrawal of the vitiated air, and a **positive**, controlled "Intake" for the admission of fresh air. It is a complete ventilating system in itself, capable of effecting a complete change of the car air as frequently as service conditions warrant and without perceptible draughts. It is in successful service on thousands of Electric and Steam cars throughout the United States and Canada.

If you want
the BEST,
that's the
"Automatic."
"Car Ven-
tilation"
booklet on
request.



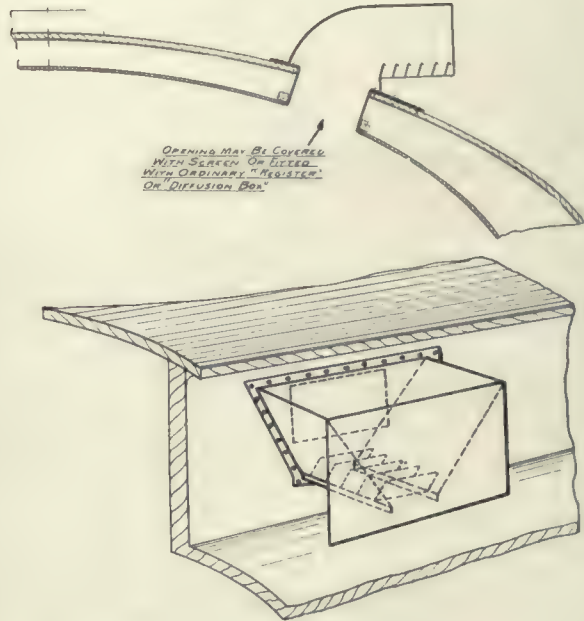
"Arch-Roof" Installation of our "Intake-and-Exhaust" Ventilators

Let us know your requirements.

ILATORS

TYPE
PRICES

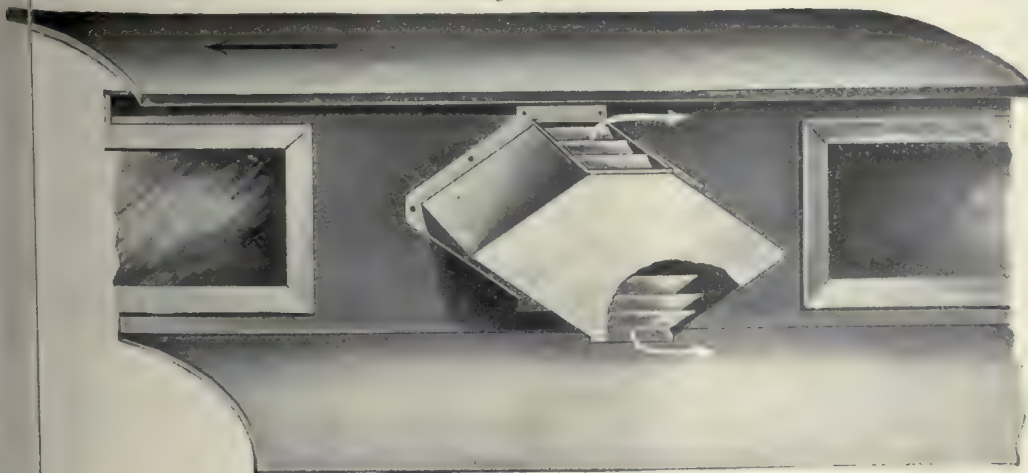
entilator Co.
w York, N. Y.



"EXHAUST" TYPE:

PRICES: \$1.00 to \$4.00 each

We have recently developed several "Exhaust" Ventilators for use where an "Intake" is not desired. These "AVCO Exhausts" are applicable to "monitor-deck" or "arch-roof" cars. They are strong in operation, simple in design, durable in construction, easy to apply, absolutely weather-proof and very low in price. They will give you good service and save you money.



We have had 12 years experience in the art of Car Ventilation. Our knowledge is yours for the asking.

"Monitor-deck" Installation of "AVCO EXHAUST" Ventilators

will send you literature and prices.



Twenty new steel cars operated by the
Lehigh Traction Company are equipped
with Utility Thermometer Control and

UTILITY

VENTILATORS



Regardless of whether the car is moving or standing still, if it is equipped with UTILITY Ventilators, the air in the car will always be pure and fresh.

This is due to the powerful exhaust of these ventilators.

They are built on the "honey-comb" principle and are open at top and bottom. As the air currents pass above and below the ventilator vacuums are created, which cause a rush of foul air from the car. Clean, pure air naturally takes its place. In this way there is a continual change of air in the car.

You will find in this ventilator a means of adequately ventilating your cars at an installa-

tion and maintenance cost exceptionally low. They are made for both round-roof and deck-type cars.

UTILITY Ventilators are simple in construction, durable, weatherproof and extremely easy to install. They are so designed that rain, snow, dust, dirt or cinders cannot enter the opening, but must fall through to the car roof.

The success and popularity of UTILITY Ventilators is expressed in the following partial list of installations since Jan. 1, 1916.

Reading Transit & Light Co.... 15 cars
Stone & Webster Engineering Corporation 35 "

Pittsburgh Railways Co..... 15 cars
Canadian Pacific Ry..... 12 "
Chicago & Milwaukee Elec. R.R. 15 "
Binghamton Ry. Co..... 16 "
Sioux City Service Co..... 10 "
Mahoning & Shenango Ry. & Light Co..... 10 "
Connecticut Co..... 100 "
Holyoke Street Ry..... 10 "
Buffalo & Lake Erie Trac'n Co. 15 "
Illinois Central..... 94 "
Scranton Ry. Co..... 10 "
Southern Pacific Co..... 50 "

Total Installations in Four Years 5,000 cars

UTILITY Electric Thermometer Control

Ninety electric railways have equipped more than three thousand cars with UTILITY Thermometer Control. Think of the varied conditions under which they must operate and yet there has never been a serious complaint.

Actual service tests have demonstrated more than 50% saving in current consumed by heaters on cars equipped with this method of control.

There is still another saving in the rush-hour loads, just the times when you need the current for car operation. In many instances this saving amounts to more in dollars and cents than the actual saving in heater current.

Every instrument sold under a positive guarantee. They will more than pay for themselves in one heating season.

The Utility Thermometer Control is the only instrument of its kind on the market covered by United States Letters Patent, in which the cutout is controlled by a relay and the relay by a mercury thermostat.

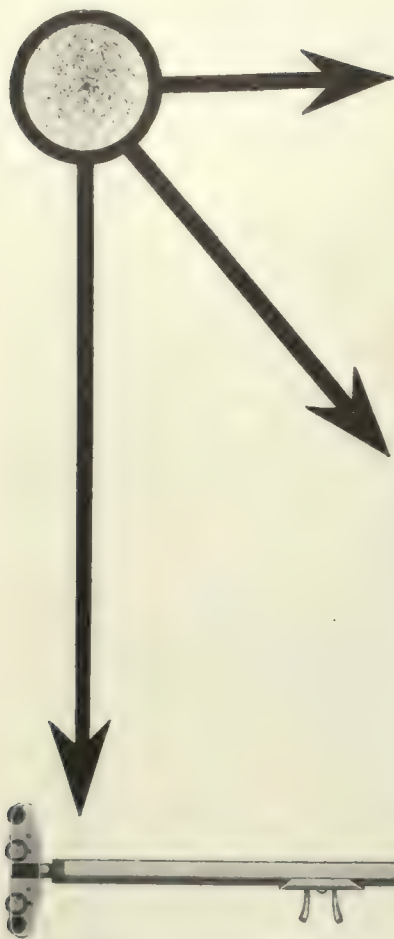
Write for complete information on UTILITY Ventilators and Electric Thermometer Control. An investigation incurs no obligation on your part and we'll be glad of an opportunity to help you in solving your problems.

See Our Exhibit at the Convention, Spaces 502 and 504

Railway Utility Co.

Chicago, 721 W. Fulton Street

New York, 1328 Broadway



We can fill your order for any type of curtain fixture on the market

We are the originators of car curtains. We have been developing and making fixtures for 25 years. We have all standard types for sale.

But there is only one type which will give complete and continuous satisfaction
—The Ring Fixture

It stays in the groove.

It will not creep.

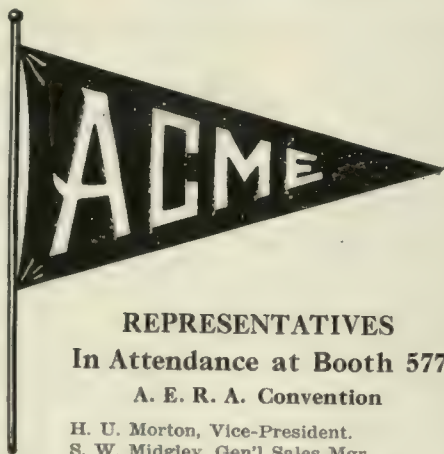
It stays level. It lets go when the passenger takes hold. It takes hold when the passenger lets go.

It stands the wear.

The Curtain Supply Co.

322 W. Ohio St.

Chicago, Ill.



REPRESENTATIVES

In Attendance at Booth 577

A. E. R. A. Convention

H. U. Morton, Vice-President.
 S. W. Midgley, Gen'l Sales Mgr.
 W. M. Wampler, Eastern Sales Mgr.
 F. M. Grigg, Southeastern Sales Mgr.
 F. M. Nicholl, Eastern and Canadian Sales Rep.
 R. C. Munro, Western Sales Rep.
 E. B. Van Patten, Southwestern Sales Rep.

Acme Products

Enclosed Groove F. P. Curtain Fixtures.
 Crown Curtain Fixtures (for open grooves).
 Gem Curtain Fixtures (for open grooves).
 Acme Fiction Roller Curtain Fixtures.
 All-Metal Curtain Rollers.
 Regal Revolving Steel Shade Boxes for Window Curtains.
 Duplex Weatherproof Window Outfits.
 Acme Improved Weatherstripping.
 Sash Locks and Fixtures.
 Anti-Pinch Hinge Door Shields.
 Steel Doors for Passenger Train Cars.
 Drawn, Pressed and Welded Steel Shapes.
 Folding Tail Gates.
 Gosso Sanitary Beds.
 Kass Safety Step Treads.
 Acme Steel Safety Step Boxes.
 Acme Brass Sash and Steel Sash.
 Acme Chanarch Steel Flooring.

Acme Supply Company

GENERAL SALES OFFICES AND FACTORY:
 28 East Jackson Blvd., Chicago, Illinois

EASTERN SALES OFFICE:
 NEW YORK CITY, 50 Church Street

PACIFIC COAST SALES OFFICES:
 SAN FRANCISCO, CAL., Monadnock Bldg.

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SOUTHEASTERN SALES OFFICE:
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LOS ANGELES, CAL., Hellman Building



Car with Agasote Roof—in service 5 years on Third Avenue Railway, New York

Two Products of Proven Value

for improving the finish, the appearance and the construction of cars—and for decreasing cost of car construction.

Pantasote Curtains Agasote Roofing and Headlining

The superior value of these three products from every view point of efficiency and economy has been demonstrated conclusively by the electric railway industry's experience with them in years of actual service.

Full data and facts regarding them are at your service.

The Pantasote Co.

11 Broadway, New York

797 Monadnock Bldg., San Francisco

Peoples Gas Bldg., Chicago



In the steel cars of the Chicago Elevated Railroad



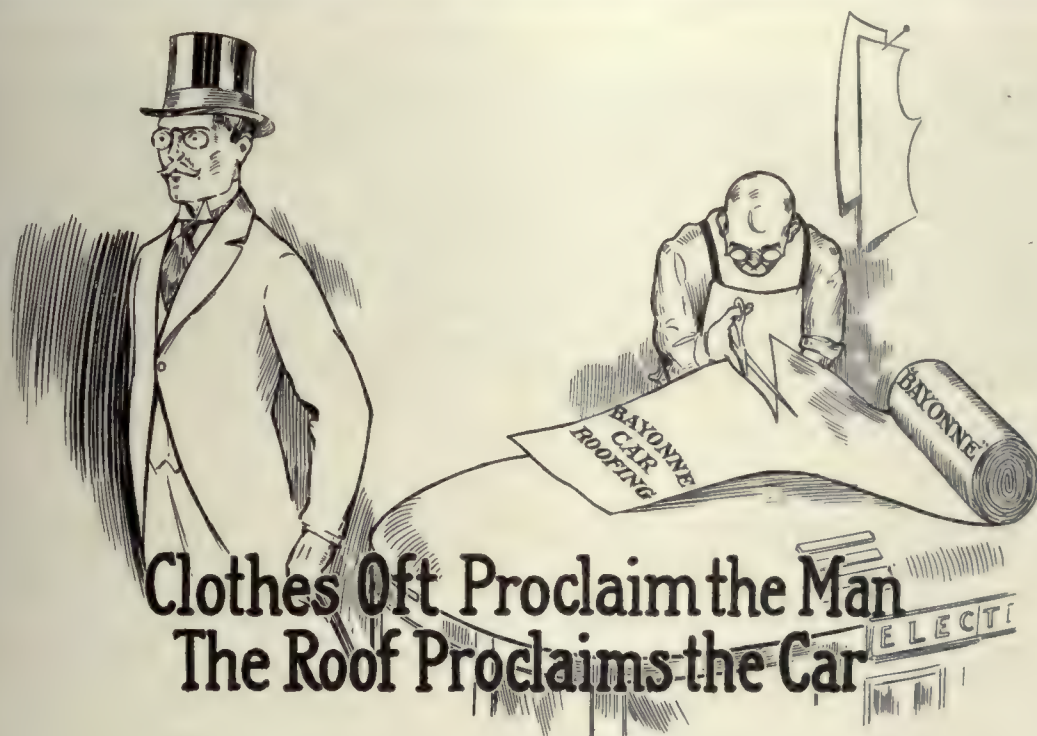
Samson Spot Trolley Cord Waterproofed

can be distinguished at a glance by our trade mark, the Colored Spots. Stands the wear because it is made of extra quality stock, smoothly braided. Resists the action of the weather because it is firmly braided and thoroughly waterproofed.

Samson Bell and Register Cord

All sizes and colors, with wire centre if desired. Resists abrasion far longer than common rough cord. More durable and economical than any other material. Samples and prices gladly sent.

SAMSON CORDAGE WORKS
BOSTON, MASSACHUSETTS



**Clothes Oft Proclaim the Man
The Roof Proclaims the Car**

If it is a good car it has a good roof. It is also true that a good roofing like

“Bayonne” Treated Roofing makes a good car

After it has made a car look right by sprucing up the exterior it makes the car stay right by protecting the interior.

Bayonne Car Roofing keeps the life in and the undesirable elements out. If you could see how it was manufactured you would understand why. To start with, it is not ordinary cotton duck but a special closely woven fabric. Every fibre of it is saturated with a preservative rendering it weatherproof and rot-proof. And, mind you, this impregnation of the fibres is a mechanical process giving uniformly good results. It is altogether different from the slap-dash of a paint brush over the surface of an ordinary duck roof, and also remember it is less costly than the ordinary duck roof.

When Bayonne Roofing comes to you, it is only necessary for you to attach it to the car roof and give it *one* coat of color paint. Then you can forget it for a long, long time, for it will not deteriorate under the hot rays of the sun. It will not rot or let snow or rain seep into the car and spoil headlinings.

It is a real time and money saver both in installation and maintenance.

You should write for samples today.

Wide Cotton Duck—Largest stock and assortment in United States. Also headquarters for cheesecloth and bunting.

JOHN BOYLE & CO., INC.

112-114 Duane Street

New York City

70-72 Reade Street

Branch House, 202-204 Market St., St. Louis, Mo.

An American Standard

In Service From Coast to Coast From Canada to Texas

New York

Cheyenne, Wyo.
Billings, Mont.

Brooklyn

Galveston, Tex.
San Antonio, Texas

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H-B LIFE GUARD

Buffalo

Dayton, Ohio
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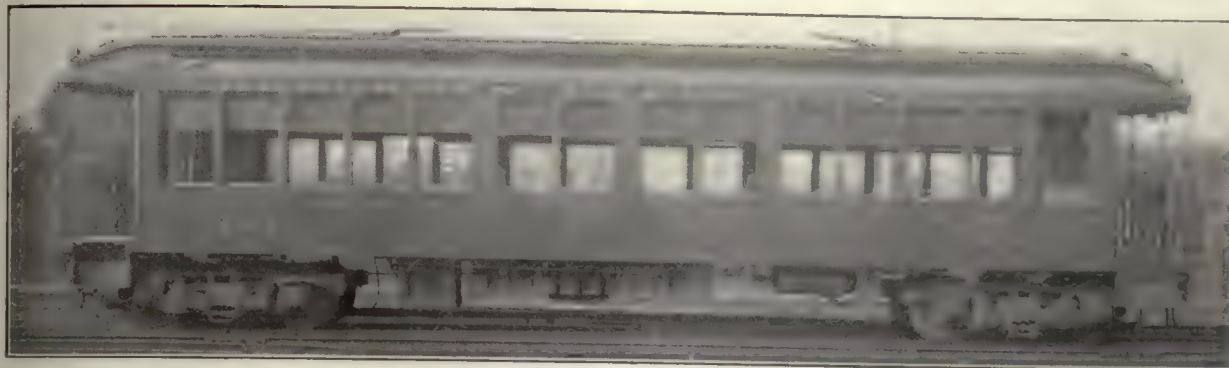
Fargo, N. D.
Bellingham, Wash.

They Insure the Railway against heavy damage claims
and the Public against serious injury

The Consolidated Car Fender Co.

Providence, R. I.

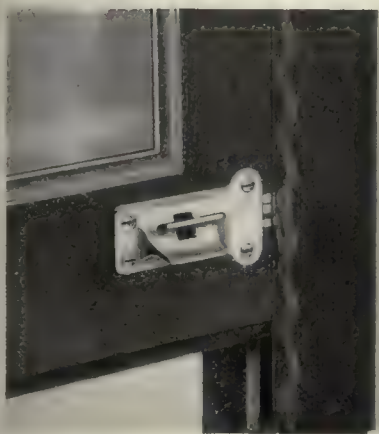
General Sales Agents, **Wendell & Mac Duffie Co.,** 61 Broadway, N. Y.



Edwards Sash Locks on the Brooklyn Elevated Cars

EDWARDS SASH LOCKS

Brooklyn Uses them for Safety as Well as Efficiency



The Brooklyn Rapid Transit System is so well pleased with Edwards sash locks that in addition to installing them on new cars it is also placing them on hundreds of other cars as a part of "Safety First" for its passengers.

Read what the Departmental Safety Committee of the Brooklyn Rapid Transit System said in the Seventh Quarterly Report of the Mechanical Department, dated April 1, 1916.

"The older style sash locks, somewhat difficult to maintain, have always been a source of concern in injuries where oftentimes children are involved. In other words, unless the sash was opened fully and the lock properly latched, the sash would jar loose and has frequently been the cause of bruised arms, fingers, or more serious injury. The new style being installed and now placed upon a good many hundreds of cars, will prevent the sash from dropping, regardless of the height to which it may have been raised."

Edwards sash locks will *please* and *protect* your patrons.

The O. M. Edwards Co., Inc.

Window Fixtures
Top, bottom & side Weather Stripping
Metal Sash and Mouldings

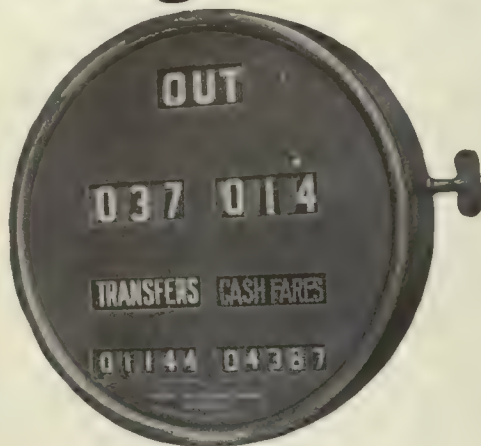
Syracuse, N.Y.

Metal Extension Platform Trap Doors
All-Metal Sash Balances & Shade Rollers
Railway Devices



Edwards Sash Locks on the N. Y. Municipal Railway Cars

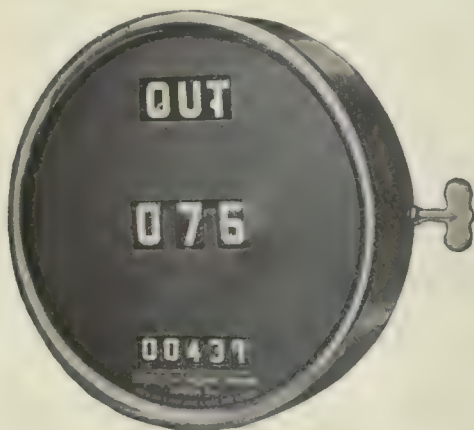
Sterling Registers



**Number 16
Double, Full-Geared**

Has no carrying dogs or pawls. Registration is started by throwing a Geneva gear into action with the main carrying arm, which is directly connected to the unit trip wheel and gear, which in turn are connected to the unit totalizer wheel. This assures positive registration on both trip and totalizer.

Trip Capacity, 999 for each class of fare; Register Capacity, 99,999 for each class of fare. Trip figures are $1 \frac{1}{16}$ " high.



**Number 15
Single, Full-Geared**

Trip Capacity, 999; Register Capacity, 99,999; Trip figures, $1 \frac{1}{16}$ " high.

All Sterling Registers are full-geared, with interlocking mechanism which cannot be upset—they cannot be operated incorrectly. Equipped with patent hammer, which prevents broken bells and hammers. Registration is positive, and is easily read from end of longest car.

Write for Catalog, which describes the complete line.

**THE NEW HAVEN
TROLLEY SUPPLY CO.**
NEW HAVEN CONN.

A Small Detail for Railway Service



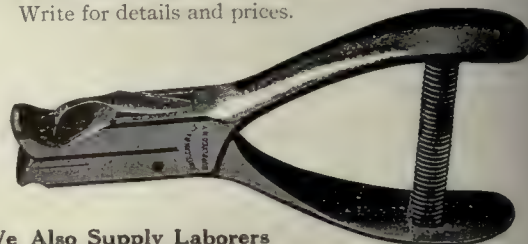
but you can save
money on

Badges,
Punches,
Buttons, etc.,
by buying or specifying to your supply man

**American
Quality**

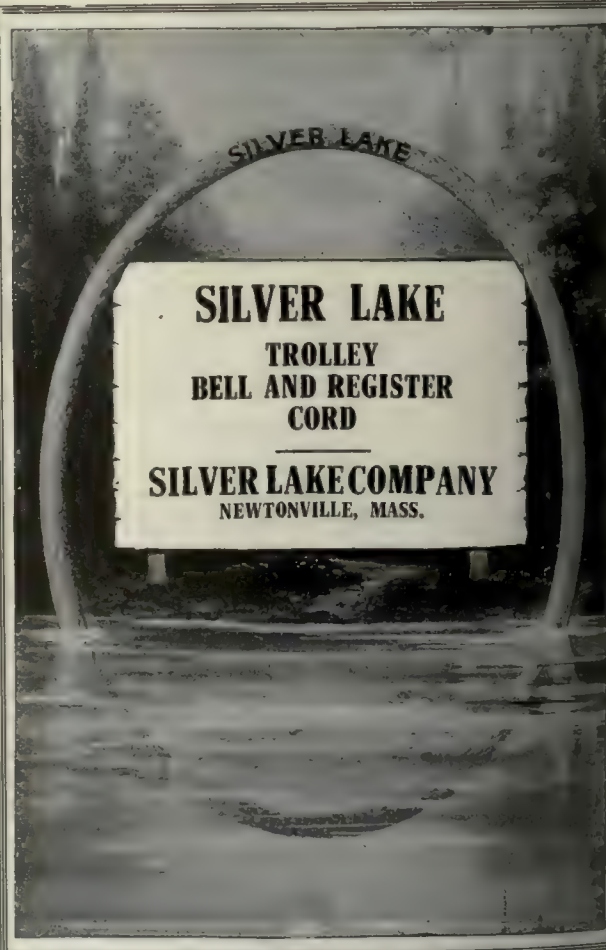


You will be sure to get the neat clean cut serviceable kind
Write for details and prices.



We Also Supply Laborers
Identification Checks

AMERICAN RAILWAY SUPPLY CO.
134-136 CHARLES ST. NEW YORK





Portland-Lewiston Interurban Car Equipped with Miller Trolley Shoes

Miller Trolley Shoe

A Year's Service in Maine Demonstrates Splendid Utility

The Portland-Lewiston division of the Androscoggin Electric Company began to use the Miller trolley shoe about September, 1915. Passenger cars were operated up to 60 m.p.h. with a running time of 1 hr. 20 min. for the limiteds on the 35 miles between terminals. The limited cars make 350 miles a day.

The operators naturally want the best for that kind of service. Here's what they bought: 24 Miller shoes (including spares) for eight passenger cars; 6 shoes (including spares) for two freight cars; 2 shoes for electric locomotive.

Here's the result in life under a No. 0000 catenary:
Average miles per shoe 3000 to 5000.
Maximum miles per shoe 6495 miles.

Remember that means only the replacement of the SHOE. The sides wear much longer.

Here's what a motorman said:

"We can now run at full speed around a dozen curves that used to require a slowdown. In any ordinary service *you can't* throw these shoes off the wire."

Here are a few other facts:

Absence of noise and heat is noteworthy, and wear on brake shoes is reduced because of ability to maintain full speed over a greater portion of line.

Trolley pole tension has been eased off 8 to 9 lb.

It was formerly necessary to oil trolley wheels after every trip. No oil or grease is required in Miller shoes.

A new insert can be put in in 2 minutes easily, compared with at least 5 minutes for a trolley wheel. At the ends of the shoe is a "play" of from 1.25 to 1.75 in.

The Miller shoe helps in sleet cutting, too, last winter's record proving it far better than with trolley wheels.

Away with prejudice! Write us today about equipment for your line.

MILLER TROLLEY SHOE CO.

53 STATE STREET

BOSTON, MASS.

SALES REPRESENTATIVES:

HOLDEN & WHITE, Chicago
S. I. WAILES, Los Angeles, Cal.

F. F. BODLER, San Francisco, Cal.
ALFRED CONNER, Denver, Col.

W. M. McCLINTOCK, St. Paul, Minn.

W. F. McKENNEY, Portland, Oregon
T. C. WHITE & CO., St. Louis, Mo.
C. S. SAENGER & SON, Cleveland, Ohio

They expected ordinary trolley wheel service

they got
EXTRAORDINARY
service from
HENSLEY WHEELS
(Four times the Life)

I should have advised you earlier as to the results we were getting but we really expected the goods to be gone weeks ago. Get

EMERSON CAREY, President
L. A. BURKE, Vice-President

THE HUTCHINSON INTER-URBAN RAILWAY COMPANY
J. E. HUMBERT, GENERAL MANAGER

HUTCHINSON, KANSAS April 14th 1915

The Hensley Trolley & Mfg. Co.,
Detroit, Mich.

Gentlemen:-

Replying to your favor 12th inst. in re test on sample trolley harp and wheel, beg to say that from the tone of your letter I should say you thought we had sufficient time to get all the mileage out of your wheel and harp; and then some but you will no doubt be surprised when I advise you that the wheel and harp was put in service on Jan. 1 on our car #59 that made a mileage of 162 per day, harp and wheel was removed 8th inst. 98 days later and showed full-ins aggregating 6 days or 92 full days test service, showing a mileage of about 11,804 miles.

Along side of our #59 was our #52 running on the same division, this car was equipped with a new xxxxx harp and xxxxxxxx wheel. As soon as this wheel was worn out, we replaced with xxxxxxxx wheel, then when it was worn out we replaced with a xxxxx wheel which also wore out, then another xxxxxxxx wheel was placed in service and it too was ready to junk by the 8th inst. so you can see that your wheel and harp lived in parallel service as long as the four wheels above named; I might mention that our xxxxx harp wore out many washers, springs, etc. and the harp itself had to be renewed once during this test the second on being junked at the end of the test.

I am now waiting for a quotation on your wheels and harps and as soon as our present stock of supplies are reduced will award you an order; trusting you are satisfied with the result of this test, I beg to remain,

Yours very truly,

James E. Humbert

EMERSON CAREY, President
L. A. BURKE, Vice-President

THE HUTCHINSON INTER-URBAN RAILWAY COMPANY
J. E. HUMBERT, GENERAL MANAGER

H. J. CAREY, Treasurer
J. LEE DICK, Secretary

Mr. A. C. Sullivan, Mgr.
Sales Dept.,
The Hensley Trolley & Mfg. Co.
Detroit, Mich.

Dear Sir:-

Replying to your favor Apr. 23rd 1915. asking permission to make use of our letter Apr. 14th 1915. beg to say that it was not written with a view of an advertisement but was simply a statement of facts brought out in running the test on your wheel and harp; however if it is of any use to you, we are very glad to grant you the privilege of using it as you see fit. I would suggest that your competitors names be left in blank, but after second thought that makes no difference, use it just as written if you like. There are no statements made in the letter that we have not the facts to back up.

I am mailing you an order for wheels and harps under the same cover. Wishing you and your business success, I beg to remain,

JEN

Yours very truly,

James E. Humbert



The cause of it all

The Hensley One-Piece Trolley Wheel

There are good logical reasons why the Hensley trolley wheel gave four times the life of other wheels—why you can bank on similar service.

The patented slotted hub cavity means a positive "forced-feed" lubrication, thus reducing friction and the consequent slippage to a minimum. This cavity can be filled in a few seconds—no bushings being necessary.

It is made of Resisto Bronze, which is a tough, durable metal offering little wear to the wire.

The method of manufacturing guards against imperfections and assures proper balance, thereby eliminating arcing and the consequent pitting. All sizes—all types.

Hensley Trolley & Mfg. Co., Detroit, Mich



Specialization Spells Superiority



Devoting twenty-odd years to the exclusive manufacture of trolley wheels and harps is double concentrated specialization. It has *earned* for Kalamazoo products the designation of superiority and the lion's share of America's trolley wheel and harp business.

That specialization is reflected in all Kalamazoo wheels, which are made of pure lake copper, of the highest conductivity. They are easy on the wire, hard to wear out, stand the strain on curves, and run in sleet longer than any composition wheel. They are self-oiling and perfectly balanced. Service has proved them.

KALAMAZOO

Trolley Wheels—Trolley Harps

It's the same with Kalamazoo arcless harps—harps of perfect and continuous contact. Only *one* cotter pin to remove to change wheels. Thick washers with lugs to hold them in place when putting in wheels. Protected springs, protected cotter pins—it's true



Kalamazoos Cut Costs

we'll be glad to send you our catalog
You'll be glad you wrote



STAR BRASS WORKS

KALAMAZOO, MICHIGAN



**We are trying to keep
this space as clean
as the records of**

**All genuine graphited "Oil-less
Bearings" have always been
made at Bound Brook, N. J., in
the United States of America,
by the**

Bound Brook Oil

Formerly the

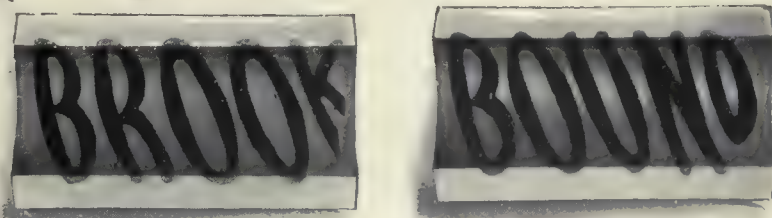
"NIGRUM"

Trade Mark Reg. U. S. Pat. Off.

Impregnated Wood Bearings

"Nigrum" Impregnated Wood Bearings
Are Made for Conditions Where Insulating Qualities Are Required.

Full Data on Request



Trade Mark Reg. U. S. Pat. Off.

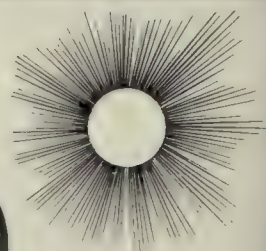
Trolley Wheel Bushings

s Bearing Company

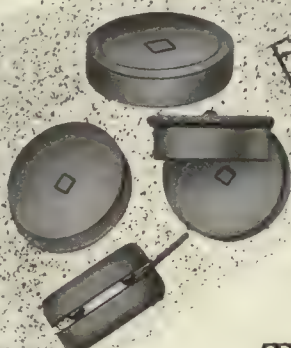
Lubricating Co.

Eclipse Trolley Retriever

A retriever of half the usual number of parts. A mechanism of quick action suitable for any range of service. Thumb nut control of weak spring tension from outside of casing. Knot the rope if you will; it won't hurt the Eclipse. It is a real retriever and has made good. Send for a sample on 30 days' trial.

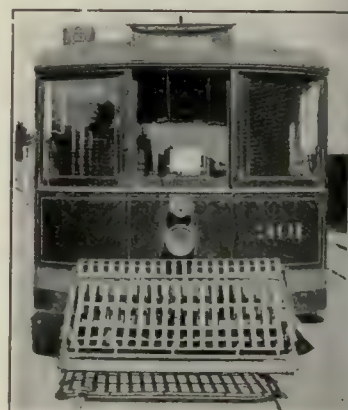


Eclipse Life Guard



Eclipsing them all

The guard of positive safety. If you would protect your public and protect your earnings you could not do better than to equip your cars with Eclipse Life Guards. Eclipse Fenders are completely successful up to thirty miles per hour. Write for details.



Manufactured by

The Eclipse Railway Supply Co.
4909 Luther Avenue Cleveland, Ohio

Root Spring Scrapers

Are now standard on more than one thousand railways in the U. S. and Canada. The scrapers are made on the spring principle, which enables them to yield and pass safely over bad pavements, switches, crossings, etc. Made for both hand and air operation and in types to fit any car. More than 15,000 in use.

The No. 7 scraper, our latest, is designed specially for low cars. Requires little attention from motorman. Works backward equally as well as forward.



Scraper No. 6

Scraper No. 6 is a real heavy-snow fighter. It can be made in lengths from 9 to 12 feet. Will clear snow in middle and sides of track level with top of rails. Will handle any amount of snow better and at 1/10th the cost of a sweeper. It's the last word as a snow fighter. Many prominent roads have proven this and adopted it.

Let us quote you prices on our standard or special types of scrapers.

ROOT SPRING SCRAPER COMPANY, Kalamazoo, Mich.

High Trolley Maintenance Costs Flee Before THE BAYONET

Many leading electric railways are saving as much as 33⅓% in trolley maintenance costs by standardizing on

BAYONET TROLLEY EQUIPMENT



You not only save money on trolley wheels, harps and bases, but considerable time when changing a Bayonet Trolley Harp or a pole if the Bayonet Trolley Base is used.

Ten seconds—with your hands—and the harp is changed. Sixty seconds is sufficient for changing a pole. No tools required.



Bayonet
Trolley Harp

The Bayonet Trolley Base



assures you of perfect alignment of trolley wheel. Roller bearings practically eliminate friction. Uniform pressure on wire is maintained at *any pole angle* at all times. There are other features which a trial will demonstrate—let us send a set, Base, Harp and Trolley-wheel, to test on one of your cars *at our risk*.

If, after two months' use, you are not satisfied that *Bayonet Equipment* is better than any other, return to us at our expense.



75 Styles,
Sizes or Com-
binations of
Bayonet
Harps

Write now for catalog describing fully each of these devices.

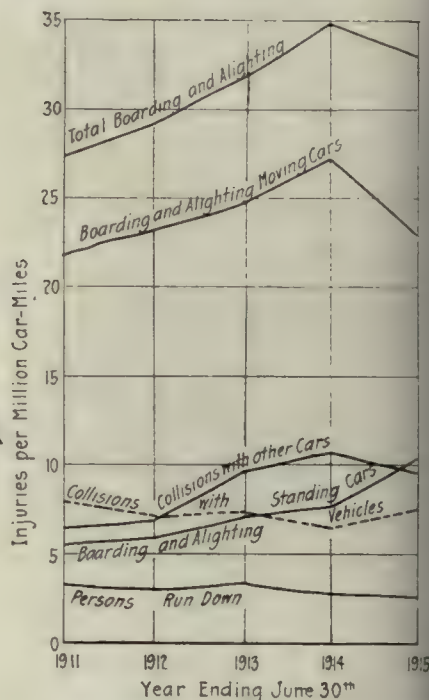
See our Exhibit, Space 541, The Annex, A. E. R. A. Convention

Bayonet Trolley Harp Co., Springfield, Ohio

The Mason Safety Tread

Reduces Boarding and Alighting Accidents

"Boarding" and "alighting" accidents are the most frequent types. The public, despite all safety-first campaigns, is **not** careful in stepping on and off of cars. The Mason Safety Tread minimizes such accidents by putting a non-slip surface under the passenger's feet. It is long lasting and reasonable in cost. Used also on platforms, station steps and inclined runways—wherever a specially safe footing is required.



Accidents on an Eastern Railway
—Electric Railway Journal, July 1, 1916



STANWOOD Car Steps

Safe and Clean in Any Weather

Formed of steel strips bent into a "honeycomb" surface which allows snow, mud and dirt to slip through; the surface is kept clean and the slip-preventing qualities are never impaired. The tread strips are high carbon steel—practically everlasting. Single, double, triple and folding types.

Write for particulars about these two specialties and also about KARBOLITH, the lightweight sanitary and fireproof car flooring.

American Mason Safety Tread Company

MAIN OFFICES: LOWELL, MASS.

BRANCH OFFICES: Boston, New York, Philadelphia, Washington, Chicago, Cleveland, St. Louis, Kansas City

TRADE

MARK

Anderson-Ellcon Switch

Trolley Wheels - Harps - Sleet Cutters

Canopy-Switch

Lindall Brush Holder

Ajax Lightning Arrester Anderson Trolley Base

Anderson Canopy Switches

Superseding car circuit breakers.

Long, positive, quick break eliminates injurious arcing. Vulcanized fibre housing. No sticking of switch blade in clips—no parts to jar loose. Simple, rugged unobstructive.

Trolley Wheels and Sleet Cutters

Perfectly designed. Perfectly balanced. Spoked and solid types, with or without oil well. Harps of steel or malleable iron. Anderson quality. You know what that means

Ajax Lightning Arrester

Offers unfailing protection. Constant spark gap and freedom from mechanically operated parts are among its points of superiority.

Anderson "Boston" Trolley Bases

Are the choice of many railways abroad and at home. Insure an even pressure of the wheel against the trolley wire regardless of pole angle. Easy adjustment. Tension 25-45 lb.

Lindall Brush Holder

Gives better commutation and reduced motor flashing, due to perfect constant brush pressure. No pigtaills. Easy inspection and renewal of brushes. Designed by Mr. John Lindall, Supt. of Equipment of the Boston Elevated Railway Co.

Aetna Insulation Line Material

Aetna means breakdown proof. Third rail insulators, poles, frogs, crossings, section insulators and switches. Write for catalog No. 8.

Albert & J. M. Anderson Mfg. Co.

(Established 1877)

Boston, Mass., U. S. A.

289-293 A Street

BRANCHES:

New York, 135 Broadway
Chicago, 105 So. Dearborn Street
Philadelphia, 429 Real Estate Trust Bldg.
San Francisco, 613 Postal Telegraph Bldg.
London, E. C., 48 Milton Street



CONTROLLER PARTS

Our new bulletin on controller parts is now ready. We make all types and designs and can ship promptly. Special parts made to order.

We also have ready bulletins on trolley wheels and line material. Ask for them.

THE EUREKA COMPANY NORTH EAST PENNSYLVANIA

We also manufacture—Commutators, Commutator Bars, Brush Holders, Copper Leaf and Gauze Brushes, Bearings and Bushings, Soldering Coppers, Copper Hammers, Drop Forgings, Copper, Bronze and Brass Castings.



Ideal Catchers Cost an Average of 7 Cents a Year for Maintenance

over a period of six years. These figures aren't based on imagination—they are taken from the books of several big, up-to-the-second railways, and will be verified at your request.

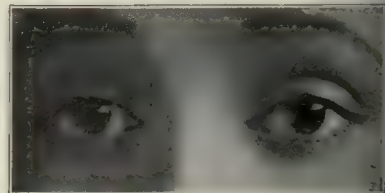
This low maintenance cost was not due to any special local conditions, for the roads selected are scattered all over the country.

Ideal Catchers cannot clog with snow or ice, because the large openings at top and bottom give perfect drainage, besides allowing free action after a knot has been tied in the trolley rope. Easily dismantled for inspection or repair by simply removing the center shaft bolt—no other bolts, screws or cotter pins are used.

The Trolley Supply Co.

Canton,
Ohio

LOOK



at the line we represent

SOME OF OUR LEADERS

Steel Tubular Poles
Overhead Line Material
Shaw Lightning Arresters
Earl Catchers and Retrievers
Holland Trolley Bases
Automatic Trolley Guard
Shelby Seamless Trolley Poles
Adamantine Trolley Wheel Bushings
Anti-Slip and Universal Treads
Van Dorn & Dutton Gears and Pinions
Salamander Asbestos Covered Magnet Wire
Eureka Bars and Assembled Commutators



**We Can Save
You Money**



The W. R. Garton Company

Representing Manufacturers of Electrical Equipment for Street Railways,

15 So. Desplaines Street, Chicago



Hard-Tough-Cool-running

The Ideal
Armature Metal

It will pay you
to investigate

E. L. Post & Co., Inc., Sole Manufacturers
50 Cliff St., New York

*Why take a chance on imitations
when you know "Tool Steel" gears are BEST*

Practically non-breakable

Mileage 7 to 10 times as great as Untreated gears
and 2 to 3 times as great as the best other "Specials".

Equip with "Tool Steel" gears and pinions and gear-
change labor costs vanish.

These claims have been proven
through nine years of grilling tests.

THE TOOL STEEL GEAR AND PINION CO.
CINCINNATI, OHIO



Considerable **time** is spent in babbitting bearings. The better the **material** used in babbitting the less often will come the necessity for re-babbitting, consequently the more time will be saved. Hardy's S. S. Metal has demonstrated its superiority over all other bearing metal alloys in actual service. As to its economy consider points 2 and 5 of its many advantages.

1 Compressive Strength

COMPRESSIVE STRENGTH—12,095 lb. per sq. in., far beyond any mechanical demand.

2 Specific Gravity

SPECIFIC GRAVITY—7.32, the lightest of any known anti-friction metal. In filling a bearing FIVE to FORTY per cent less is used according to the mixture of other bearing metal alloys.

3 Shrinkage

SHRINKAGE— $5/64$ in. to the foot when poured into an iron mold.

4 Melting Temperature

MELTING TEMPERATURE— 316°C . or 600°F . It is fluid and in condition to pour well at 454°C . or 850°F .

5 Anti-Friction Qualities

ANTI-FRICTION QUALITIES—Runs cool under pressure that would crush many anti-friction metals; will not cut or score a shaft under any circumstances.

Correspondence solicited

WILLIAM A. HARDY & SONS CO.

FITCHBURG, MASSACHUSETTS

Three Outstanding AJAX Advantages

1. **The Service** The Ajax plants make more non-ferrous metal than any other foundry of like character in the world. This reflects tremendous manufacturing capacity and, with patterns of practically every type of electric railway bearing in use, insures quick and accurate delivery of any type of car brass. Where a pattern should not happen to be in stock it will be made on receipt of order. *This pattern service is absolutely free.*
2. **The Metal** Ajax Car Brasses are made of either Ajax plastic bronze or Ajax car bearing bronze "A." These are in themselves among the most effective and longest-wearing anti-friction metals. They have just the right plasticity to adapt themselves, without heating, to the irregularities of the service. They are very homogeneous in structure and can be used with or without babbitt lining.
3. **The Reputation** Ajax car brasses are standard on many electric and steam railroads. The tremendous Ajax production is the most conclusive evidence of the attitude toward them of electric railway men. Our engineers and metallurgists will gladly co-operate with electric railway men in devising bearing alloys where our standard formulae do not meet existing conditions fully.



For Lining Car Brasses

Long Wear—high compressive strength! These are the two exceptional properties of Ajax Bull Babbitt.

The process by which this babbitt is made—exclusively Ajax—brings forth the metal with almost entire absence of dross.

So, with equal weights, this absence of dross makes just so much more usable babbitt available. It actually amounts to more babbitt per pound, more babbitt per dollar!

Electric railway men, by constantly recurring purchases, during the last 20 years have made Ajax Bull Babbitt one of the most extensively used bearing metals in the field.

Is your road enjoying the economy and reliability that always follow where Ajax Bull Babbitt is used?

MOTOR AND AXLE BEARING

AJAX BULL BABBITT



AJAX METAL COMPANY, Philadelphia

NEW YORK, BOSTON, PITTSBURGH, WASHINGTON, CHICAGO, ST. LOUIS, SAN FRANCISCO, DETROIT



AJAX CAR BRASSES



**Your Duty Lies
Straight Ahead**

**Speer Carbon Co.
Dept. J' St. Marys, Pa.**

THE AMERICAN AUTOMATIC SLACK ADJUSTER

Promotes maximum brake efficiency by maintaining uniform piston travel.

Saves wear on compressor by economizing air.

Saves time by eliminating the necessity of hand adjustment.

Saves money by reducing cost of maintenance.

THE AMERICAN BRAKE COMPANY
1932 North Broadway, St. Louis, Mo.

Southern Wheel Company St. Louis, Missouri

FOUNDRIES

St. Louis Birmingham Atlanta Savannah

MANUFACTURERS OF

The Special Chilled Iron CAR WHEEL

FOR

**STREET AND INTERURBAN
SERVICE**

ONE WEAR

LONG WEAR

There Is a
VAN DORN



Coupler

**for every condition
and
every requirement**

**The Van Dorn
Radial M.C.B.
Coupler**

is shown above

It has a positive lock, lock-set, and knuckle throw.

Couples by impact and uncouples from side of car.

Has extended guard arm and butting wall.

Greatly facilitates coupling and prevents buckling.

Head has deep knuckles which permit wide vertical movement.

Radial carrier eliminates binding even on 30-ft. radius curve.

Van Dorn couplers are made in various types and sizes, each having special patented features. Combined with Van Dorn draft riggings they meet the particular problems of every class of service.

Van Dorn M.C.B., Pin and Link, Car and Air couplers are safe, strong, light and durable.

**Write for blueprints and
additional information**

Van Dorn Coupler Co.

2325 So. Paulina St.

Chicago, Ill.



THE RYMCO



HIGH SPEED **TROLLEY SWITCH** AUTOMATIC

FOR INTERURBAN ROADS

Operates Simultaneously and Automatically with Track Switch and can be installed with any style of

OVERHEAD CONSTRUCTION

See Our Exhibit, Space 535 A. E. R. A. Convention, Atlantic City

The systems on which this device has been adopted as Standard include the following:—

Illinois Traction System
Peoria Railway Terminal Co.
Interstate Public Service Co.
Evansville Railways Co.
Ft. Wayne & Springfield Railway
Toledo & Chicago Interurban Traction Co.
Springfield, Troy & Piqua Railway Co.
Toledo, Bowling Green & Southern Traction Co.
Chicago, Ottawa & Peoria Railway
Bluffton, Genoa & Celina Traction Co.
Youngstown & Ohio River Railroad
Dayton & Troy Electric Railway
Toledo, Fostoria & Findlay Railway
Northern Ohio Traction & Light Co.
Cleveland, Southwestern & Columbus Railway
Toledo & Western Railroad Co.
Salt Lake & Utah Railway

Stark Electric Railroad Co.
Ft. Wayne & Northern Indiana Traction Co.
Indiana Union Traction Co.
Chicago, South Bend & Northern Indiana Traction Co.
Des Moines Interurban Railway
East St. Louis & Suburban Railway
Cedar Rapids & Iowa City Railway & Light Co.
Kentucky Traction & Terminal Co.
Winona Interurban Railway
Lake Shore Electric Railway
Ohio Electric Railway
Columbus, Delaware & Marlon Railway
Muncie & Portland Traction Co.
Marion, Bluffton & Eastern Traction Co.
Kokomo, Marion & Western Traction Co.
Kansas City, Clay County & St. Joe Railway
Ogden, Logan & Idaho Railway

THE RAILWAY MATERIALS CO.

Railway Exchange, CHICAGO

Singer Building, NEW YORK

The Best Babbitt is Always the Cheapest

Babbitt metal bought on a price basis alone is short-sighted economy. It hasn't the wear. Frequent re-babbitting is necessary and there's the chance of sudden failure that means stripped armatures and all the expense of re-winding.

More-Jones Armature Babbitt Metal

is used by a majority of the leading electric roads in this country and abroad because they have found by exhaustive tests that it shows a lower net cost per mile than any other babbitt.

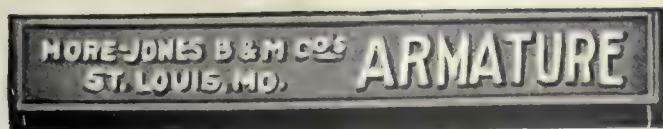
MORE-JONES ARMATURE BABBITT METAL is the product of specialized laboratory study and forty years' experience in compounding alloys. Its quality has been proved by many trials over long periods in the severest service. This babbitt contains only tin, copper, nickel and antimony—NO LEAD—and possesses the lowest co-efficient of friction and the greatest durability.

*Further information and
prices on application*

More-Jones Brass and Metal Co.
ST. LOUIS, U. S. A.

Manufacturers of

*Trolley Wheels and Harps, Contact Springs, Motor Axle Bearings,
Armature Bearings, Truck Journal Bearings, Air Compressor
Bearings, Armature Babbitt Metal and similar products*



CORLISS CARBON COMPANY

BRADFORD, PENN.

Metal Slip Ring Brushes

Designed for both soft and hard rings. Twelve different grades for various conditions.

Corliss Rotary Brushes

Built for the highest peripheral velocities. Excellent commutation characteristics. We are glad to recommend the proper grade.

Corliss New Railway Motor Brushes

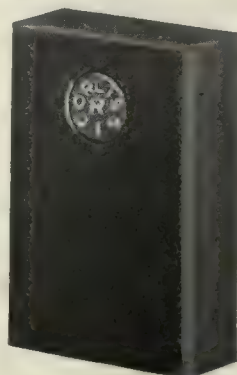
for interpole Railway Motors.

Grades R-1 and R-2

Highest quality at a

NEW Price

*Write for
bulletins*





**Hitting the
Bull's-Eye
Every
Time
That's the
Basis of
Le Carbone
Superiority**

When the **average** marksman hits the bull's-eye, that particular shot is just as good as any shot the expert sharpshooter can make. But the average marksman will never hang up the steady score of the sharpshooter.

You can find individual sets of Carbon Brushes—lots of them—which will give just as good service as any individual set of "Le Carbone." But when it comes to the steady, **continuous** delivery of high efficiency, "Le Carbone" Brushes show a very different final record.

"Le Carbone" Brushes are absolutely uniform.

What you want and need in carbon brush service, is to have the brushes and commutators working together at the highest efficiency and with the least wear on both **all the time**.

The remarkable records of economy established by "Le Carbone" Brushes are due to the fact that they deliver continuously reliable, uniform service.

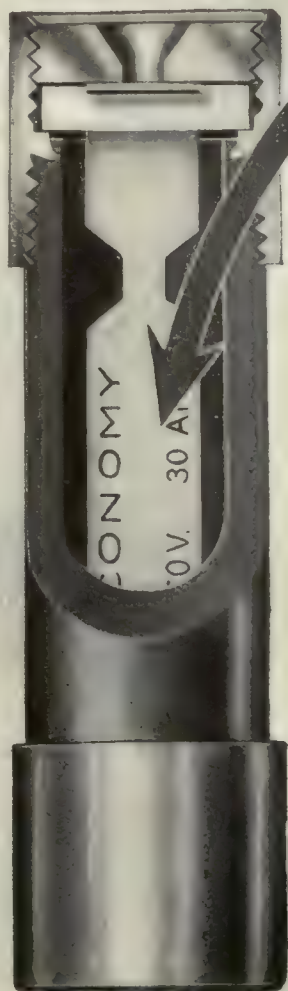
Not just some of the time—all the time.

W. J. Jeandron

173 Fulton St.

New York





The heart of an
ECONOMY
 renewable cartridge
FUSE

is the "Drop Out" Renewal Link. It is the only thing you have to replace in order to renew a blown Economy Fuse. The expense is trifling, compared to the utter extravagance of discarding an entire fuse after it has operated.

Use Economy Fuses wherever cartridge fuses are required to protect power and lighting circuits and by their use cut yearly fuse maintenance bills a full eighty per cent.

Write for Free Samples. Test them. Let the results speak for the economy and safety of Economy Fuses. Be sure to ask for Catalog 17.

**ECONOMY FUSE
 & MFG. CO.**

Kinzie and Orleans Sts.
CHICAGO



Panel board of D & W Fuses on latest type of Interborough Subway Car

100 Per Cent Confidence in D & W Fuses

The Interborough Rapid Transit Company, New York, operates the fastest subway and elevated system of the world.

The fuses installed on its cars vary in capacity from 1 amp. for the coasting clock circuit to 600 amp. for the third-rail collector shoes.

The number of fuses installed on each class of passenger car and the number of each class of cars follow:

23 fuses on each of 1023 electric motor cars.....	23,529
9 fuses on each of 751 elevated trailers	6,759
31 fuses on each of 665 high-voltage control subway motor cars.....	20,615
17 fuses on each of 291 high-voltage control subway trailers	4,947
28 fuses on each of 124 low-voltage control subway motor cars.....	3,472
15 fuses on each of 62 low-voltage control subway trailers	930
60,252 Fuses	

And Every One a D & W!

D & W FUSE CO.

Providence, R. I.

A. HALL BERRY, 97 Warren St., New York



Agents—Pettingell-Andrews Company

Western Electric Company



Central Electric Company

Personal Mention

T. G. Kelly, who has been appointed superintendent of transportation of the Fort Smith Light & Traction Company, Fort Smith, Ark., entered electric railway work with the United Railroads, San Francisco, Cal., in April, 1908. He worked for the company for some time as a motorman and then went to Fort Smith, where he entered the service of the Fort Smith Light & Traction Company as a motorman. On July 10, 1911, he was promoted to inspector. He also acted as trainmaster and assistant claim agent of the company.

Ever Analyze This Department of The Electric Railway Journal?

Ever stop to think where future general managers, superintendents and other executives are coming from?

You can bank on it that they are NOT coming from the dry goods trade, nor the meat-packing business, nor from anywhere outside the electric railway field. They **are**, in all human probability, going to rise from the ranks—from the track crew—from the repair shop—from the controller and the fare-box.

You may, or may not, have a general managership concealed about you—but you owe it to yourself to try yourself out; to see how far you can fit yourself for bigger, more important work!

And a chance to do just that is what the Electric Railway Journal offers you. To the man who skims through its pages and then tosses it aside, without securing the vital information which it contains, the Journal isn't worth a jitney a year—

But the man who appreciates what the Electric Railway Journal **is**, and what it **can** do for him—

That man uses the Journal as a tool for carving out his progress.

Don't skim through the office or shop copy of the Electric Railway Journal—you can't get its full value that way.

Have your own personal copy sent to your home. And **read** it—put it to work for **your** benefit.

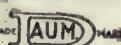


SIMPLICITY ITSELF

Four metal parts, a fibre shell, a section of fuse strip, assembled and renewed without tools, that's a



RENEWABLE FUSE

Complete electrical protection of power, heat and lighting circuits at a saving of 60 to 80 per cent over the cost of using non-renewable fuses. When a  fuse blows, you break a new fuse element from the  Renewable Fuse Strip of the right length and right amperage, and renew the fuse in a few seconds.

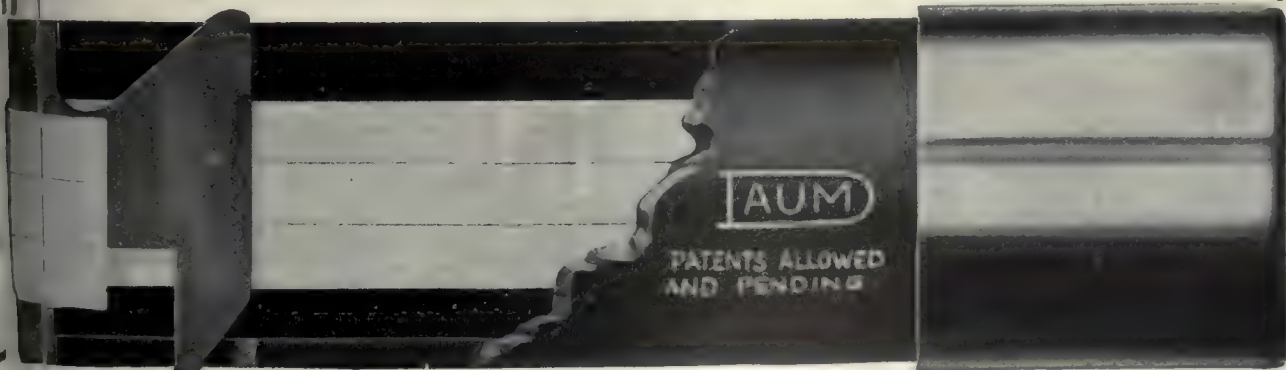
Free Samples for Convincing Proof. Write for them.

A. F. DAUM

Sole Manufacturer
PITTSBURGH, PA.

Form No. 4. 3-60 A. 250-600 V.

Representatives:
WILLIS C. SQUIRE & CO.
Western Union Bldg., Chicago
GEO. H. TRASK
76 Sacramento St., San Francisco



Union Service plus Recognized Quality

Here are six leaders in their respective fields—recognized as standard equipment by the leading systems and manufacturers.

Nuttall Gears, Pinions and Trolleys

Nuttall gears and pinions are made in three grades—each without equal in its respective field. The grades are B. P., Case Hardened and Standard. Detailed information and data will be furnished on request.

Crouse-Hinds Headlights

As recognized equipment on a large percentage of the street railway and interurban lines of the United States—these headlights have proven themselves to be without equal from both an economical and an efficiency viewpoint.

Chillingworth Gear Cases

These seamless, drawn steel gear cases with their perfected bracket that cannot shear off are specified and used by the largest electrical manufacturing companies and street railway systems. Their lightness in weight has been a great factor in their success.

G-E Rail Bonds and Line Material

These essentials are too well known for comment, being the standard equipment on the great majority of electric systems in the United States.

International Registers and Fare Boxes

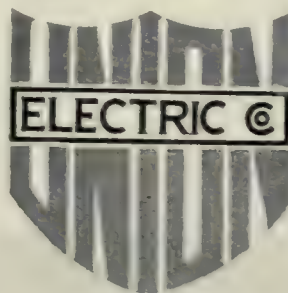
The progressive roads of the country are fast adopting the up-to-date systems inaugurated by the International.

The Motor Driven Coin Register has proven that it will speed up schedules and take all chances of fare collections.

Locke Insulators

A synonym for Best to the experienced lineman and operating man. They have absolutely no equal in their field.

WRITE FOR OUR NEW LOCKE CATALOG.



UNION ELECTRIC COMPANY

TERMINAL WAREHOUSES
PITTSBURGH, PA.



Chillingworth Drawn Steel Seamless and Rivetless Cases

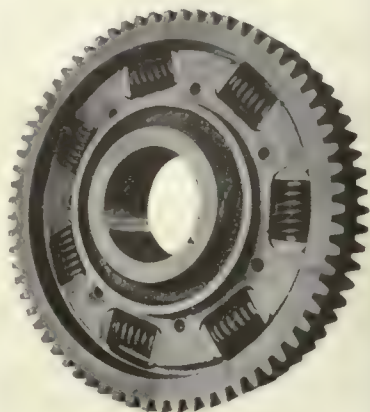
No railways can afford to haul a heavy malleable iron gear case. They know too well that such a case only adds excess weight and cost to the car without affording any advantage. Moreover, they also know it costs more to buy.

You can figure on saving about 40% in weight and a proportionate amount in cost, by using Chillingworth Cases.

THAYER & COMPANY, INC.

Selling Agents in U. S. and Canada

111 Broadway, New York



Flexible Gear; Cover Plate
Removed

Flexible Gears For Heavy Service

They absorb shocks due to rough track, brake applications, power applications, motor characteristics or any other cause.

They prolong life of bearings, commutators, brushes, brush rigging, armature windings and insulation, truck framing and running gear.

The centers, springs, cover plate, etc., are permanent and the high grade rims renewable. All internal wearing parts case hardened and ground.

They will solve your heavy service gear problem



Trolley Poles

An unlimited supply of butt welded trolley poles, not gas pipe, stand ready for your needs.

Trolley Bases, Harps and Wheels



These Nuttall products are standard for all classes of electric railway service.

There is

**A Nuttall Gear and
A Nuttall Trolley**

for every service application

Nuttall - Pittsburgh



Testing Laboratory

Nuttall Tests

are your

Guarantee

A well-equipped chemical laboratory is maintained to determine the chemical analysis of all steel being heat treated for Nuttall Gears.

After heat treatment the gears and pinions are tested with a Brinell Machine to determine the structural hardness; while a Sclerescope is used to find the surface hardness.



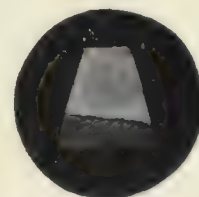
Brinell Machine for Testing Structural Hardness



Sclerescope for Testing Surface Hardness

BP Gears

are solid only, of forged steel of medium carbon content, heat treated and giving a material having exceptionally good refinement of structure, great strength and toughness, which owing to the close, dense grain of the metal after treatment greatly increases its resistance to wear. The great strength of this gear makes it applicable to severe service conditions.



Structure of B P Gear Teeth

Nuttall - - - Pittsburgh

Catskill

Heat-Treated

Gears and Pinions

Star Brand

A new type of gear and pinion especially prepared and heat-treated by a process of our own. The finest quality of rolled steel blanks are used for material.

The gears and pinions are cut true to pitch, and next are put through a special heat-treating process which gives them exceptional tensile strength. This process insures the gear and pinion a wearability of three to five times that of the ordinary gear and pinion. Prices are reasonable, and when durability is considered—very low indeed.

*Ask us
for the
complete
Data*

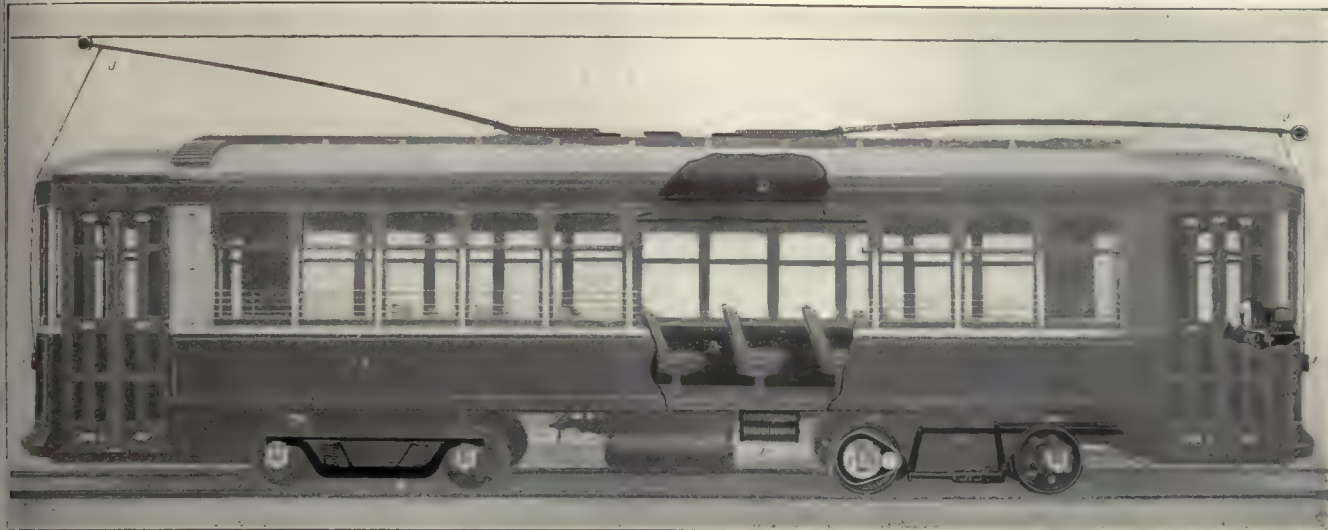


W. R. Kerschner Co., Inc.



50 Church Street, New York

This Is an All-Kerschner Car From Car Wheel to Trolley Wheel



This sketch has been prepared to show you what an important part Kerschner Service plays in making up a modern car. Let's list the items indicated on the drawing:

- A—Car body.....Cincinnati Car Company
- B—Trucks Cincinnati Car Company
- C—Door operating mechanism.... Cincinnati Car Company
- D—Headlining and panels.....Nevasplit (Keyes Product Co.)
- E—Car wheels (chilled).....Albany Car Wheel Co.
- F—Gears and pinions.....Catskill Foundry & Machine Wks.
- G—Brake-slack adjusters.....Smith-Ward Brake Co., Inc.
- H—Grid resistors.....Columbia Machine Wks. & Malleable Iron Co.
- I—Catchers and retrievers.....C. I. Earll
- J—Poles, harps and wheels.....Columbia Machine Wks. & Malleable Iron Co.
- K—Gear cases.....Columbia Machine Wks. & Malleable Iron Co.
- L—Car Trim.....Cincinnati Car Company
- M—Controller and brake handles..Columbia Machine Wks. & Malleable Iron Co.
- N—Brake rigging.....Columbia Machine Wks. & Malleable Iron Co.

Keep this page before you whenever you are buying cars or adding any of the specialties named.

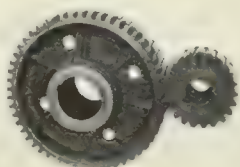
W. R. Kerschner Company, Inc.
50 Church Street, New York



RAILWAY

Special agents for
TOOL STEEL GEARS AND PINIONS

Favored for the heaviest service both here and abroad.



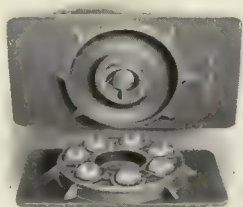
Special agents for
JOHNSON FARE BOXES

A registering fare box that has proved closest to perfection in mechanism and operation.



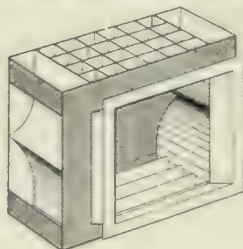
Special agents for
HARTMAN CENTERING CENTER PLATES and PERRY SIDE BEARINGS

A combination that prevents nosing and sharp flanges, besides saving much energy.



Special agents for
GARLAND VENTILATORS

A Pullman Standard, indispensable for the modern electric car.



THE GENESCO
GENESCO

U. S. Metal & Manufacturing Co.
Chicago

SUPPLIES

Southern and New England agents for
**CHILLINGWORTH SEAMLESS
GEAR CASES**

A sheet steel case of remarkable strength for its
unbelievable lightness.

Exclusive agents for
ANGLO-AMERICAN VARNISH CO.

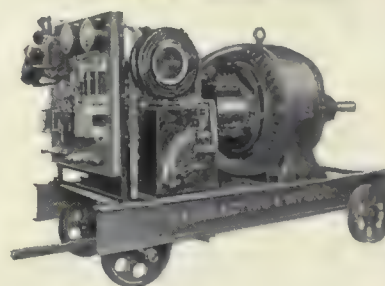
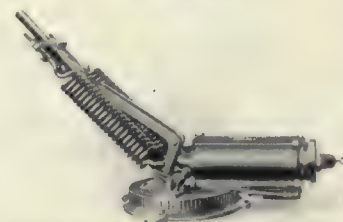
Manufacturers of railway varnishes of maximum
durability and brilliancy.

Special agents for
WASSON TROLLEY BASES

The air-operated trolley base that embodies retrieving
features.

Special agents for
C & C ELECTRIC ARC WELDERS

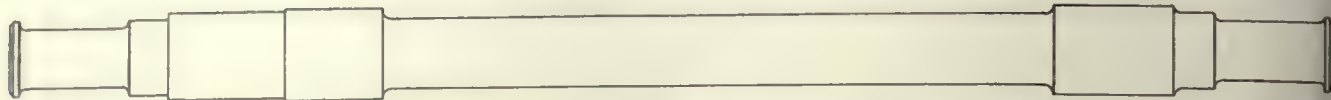
Motor-generator sets that give exactly the right
amperage without waste in resistors.



CORPORATION

PANT OIL

turing Co., New York
Washington, D. C.



Heat Treatment of Axles Revolutionized

We all realize the value of heat-treated axles in reducing weight, increasing axle life and eliminating breakage.

From your experience you know that the first requisite of a heat-treated axle is **reliability**.

The usual method used in heat treating of axles is to heat them in a furnace and quench them on their side, drawing the temper in a

furnace and testing one axle selected from each lot.

It is extremely difficult to heat steel uniformly in the usual type of furnace and very hard to determine properly the temperature of the steel being heated. Quenching on the side sets up serious internal strains which are not always relieved in tempering.

The Vasco Way

Vasco axles are heated in a molten bath.

All parts of a molten bath must be the same temperature, so any axles in that bath are bound to be treated uniformly throughout, to the temperature of that bath. The determination of temperature is simple and positive. The control absolute.

Vasco axles are quenched on end.

By quenching on end any strains set up in quick cooling are greatly minimized.

Vasco axles are drawn or tempered in a molten bath.

This insures a thorough tempering and the elimination of all internal strains.

Each individual Vasco axle is tested.

Each axle after heat treating is Brinelled and a record kept of the ultimate tensile strength of each axle as shown by the Brinell reading.

Each axle can be shock-tested also if desired.

Reliable, Safe, and Uniform axles guaranteed.

Many of the most prominent railways in the country are purchasing their axle requirements from us. Write us and let us tell you more about our product.

VALLEY STEEL COMPANY

GENERAL OFFICE AND WORKS

EAST ST. LOUIS, ILLINOIS

Southern Railway Supply & Equipment Co., St. Louis
H. F. Keegan, First National Bank Bldg., Chicago
G. E. Watts, Candler Bldg., Atlanta

F. F. Bodler, San Francisco
S. I. Wallis, Los Angeles
W. F. McKenney, Portland





Keeping Pace with the Developments of Two Generations

Horse-car days.

We can all remember the frail little "match boxes" jerking and bouncing along a narrow-gauge "snake-trail" track behind one or two old broken-down cab horses. They tipped the scales at only one or two tons when loaded to capacity, and the speed seldom reached the hair-raising rate of 6 miles per hour.

Yet within this short space of years we have seen the electric car develop into a 60-ton palace, riding as smoothly as thistledown in the air at speeds as high as 70 miles per hour.

Do you fully appreciate the changes of the last 30 or 40 years?

Can you comprehend what this ever-increasing service has demanded of the car wheel manufacturer?

Although the pace has been a hot one, we have never lost our stride, never lagged behind. The Wonderful Single-Service Chilled Iron Wheel was standard in the days of the "hobbie-horse" car, and is standard today with over 90% of the street-car companies of the United States and Canada which operate 100 cars or over.

ASSOCIATION OF MANUFACTURERS OF CHILLED CAR WHEELS

1228 McCormick Building, Chicago, Ill.

Representing Forty-eight Wheel Foundries Throughout the United States and Canada. Capacity 20,000 Chilled Iron Wheels Per Day



55 Ton High Speed Interurban Service

GRIFFIN F.C.S. WHEELS

A one-wear wheel, particularly adapted to all classes of heavy service, and will not wear eccentric through imposition of heavy loads.



If operating conditions other than ordinary, our Engineering Department will analyze them, and design wheels for any special or particular service.

Moderate First Cost
Low Maintenance Charges

Safety in Operation
Brake Shoe Economy

Griffin Wheel Company

McCormick Building
Chicago, Ill.

Chicago
St. Paul

Foundries:

Detroit
Denver
Kansas City
Los Angeles

Boston
Tacoma

Are Your Cars Ever Stalled by Frozen Air?

This Rectifier Will Prevent It



ELIMINATES "FROZEN AIR"

Alcohol supplied in just the right proportion keeps the air from freezing and softens the accumulated grease, gum and oil, thereby increasing the efficiency of the air system and making brake operation more dependable.

Air passing through the air line draws alcohol spray from the container into the air system. Not a moving part in the entire unit, yet just the correct amount of rectifying fluid is supplied to the air line.

Service tests have demonstrated its efficiency. It will free your cars of frozen

air trouble and increase the dependability of your brakes and other air-operated equipment.

Easily and quickly installed in the main air line on either old or new cars and without the need of special fittings. Better, lighter in weight, and less expensive than extra air reservoirs or other cooling systems.

Now's the time to prepare for winter trouble—so write today. Let us send you literature, prices, and any special information that you may desire.

See Our Devices in Lord Manufacturing Co's Booths A. E. R. A. Convention,
Spaces 380 and 381 at Atlantic City

National Safety Device & Man'g Co., Chicago

Lord Manufacturing Co. 105 West 40th St., New York

Sole Electric Railway Agents for New England States and New York, Pennsylvania, New Jersey, Delaware, Maryland, and the District of Columbia.

Davis Steel Wheels

ONE WEAR—NO TURNING

THE only steel wheel which gives large mileage without being turned down. The flange and tread are of hard, tough manganese steel which blends into a soft, ductile steel plate and hub.

The manganese tread and flange of the Davis Cast Steel Wheel are especially adapted to resist the shock incident to frequent cross-overs and the abrasion caused by sharp curves. The flange strength is eight times that of the cast iron wheel. It is pre-eminently a "safety-first" wheel.

Rims of Davis Wheels are ground to contour, insuring roundness of wheels. Slid-flat spots are therefore greatly reduced. Furthermore, a perfectly round wheel produces less vibration in the car body and track, and easier riding cars.

Thorough tests have shown that the co-efficient of friction of the

Davis Wheel and the steel rail is from 9 to 48% higher than that of other wheels. Therefore, with high starting accelerations, there is less slippage with the Davis Wheel than with any other type of wheel in electric railway service.

Davis Steel Wheels save approximately 20% in weight over other wheels for average service on electric lines, and at the same time provide greater strength. This saving in weight means conservation of energy at the power house.

Records of lines using Davis Steel Wheels show that the cost of maintenance is lower than that of any other type of wheel. Davis Wheels will decrease *your* wheel costs.

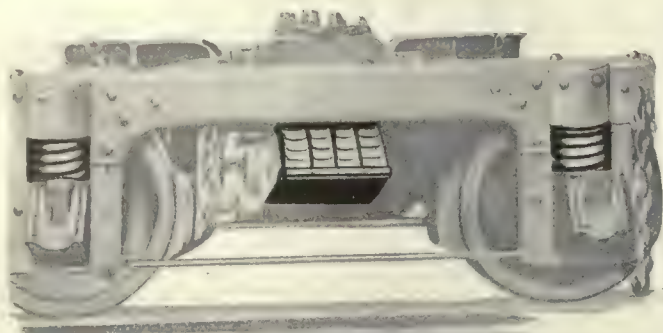
They are furnished for all classes of electric line service. Send us blue-prints of your present wheel. An estimate and design to meet your requirements will be cheerfully furnished.

Space 409 on the Pier

American Steel Foundries

1100 McCormick Building

CHICAGO



**FOR
LONG
LIFE**

**UNION
SPRINGS**

**AND
EASY
RIDING**

**COIL and
ELLIPTIC**

M. C. B. Pressed Steel
Journal Box Lids

Kensington Pressed Steel
Journal Boxes

Steel Castings

Union Spring & Mfg. Co.

General Office, Pittsburgh, Pa.

Works: New Kensington, Pa.

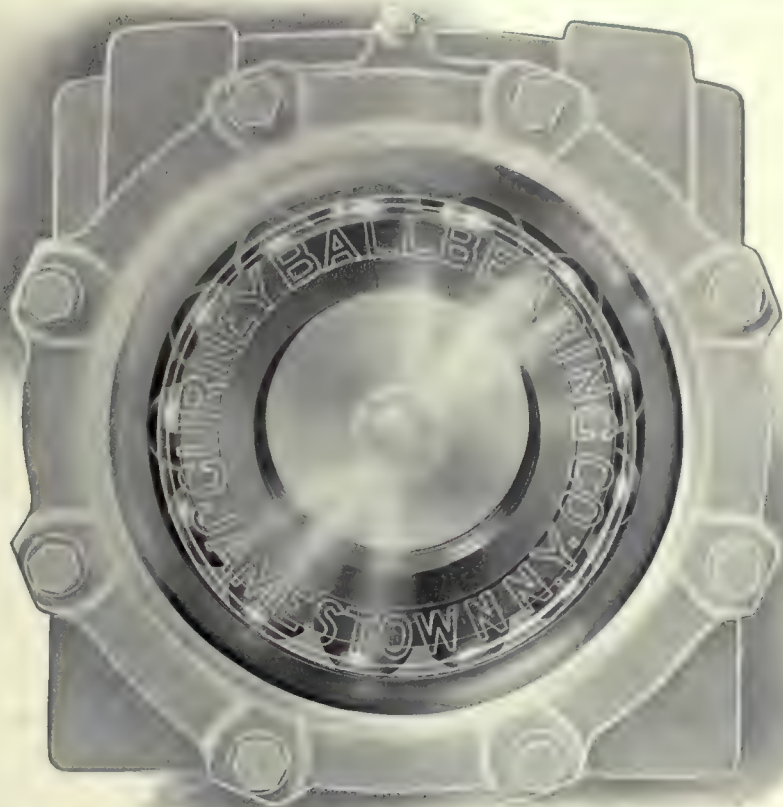
50 Church St., New York. Fisher Bldg., Chicago, Ill.

Todd Bldg., Louisville, Ky.

Mutual Bldg., Richmond, Va.

Wilkins Bldg., Washington, D. C.

"GURNEYIZE YOUR ROAD"



A BOOK agent was trying to sell a book to a farmer out in Iowa. Meeting with refusal he asked his prospect why he wouldn't buy. "I can't read no more 'cause of my poor eyesight"—"Well, that's too bad, but maybe your wife would enjoy reading this book?"—"She's visitin' with her sister down in Kentucky"—"How about your daughter?"—"She can't read, she ain't

GURNEY BALL BEARING CO.

CONRAD PATENT LICENSEE



JAMESTOWN, NEW YORK

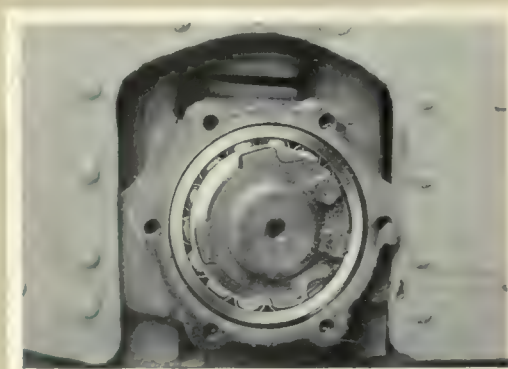
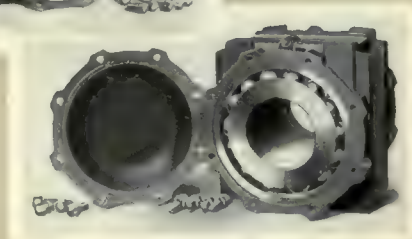
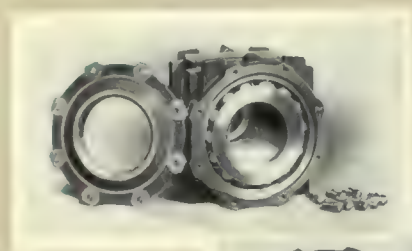
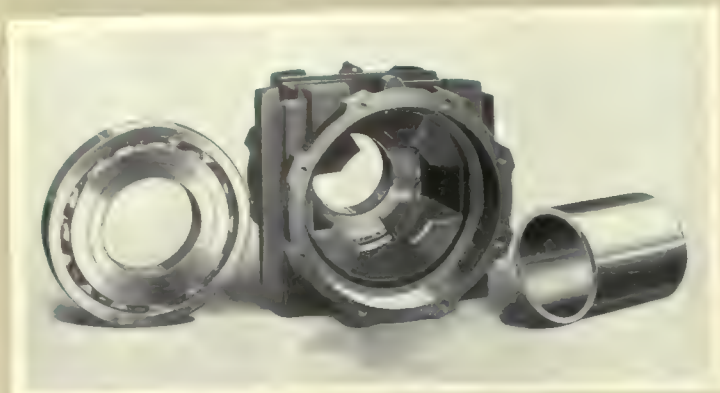
CHICAGO, ILL.

NEW YORK CITY



ON EXHIBITION, SPACE 377-379

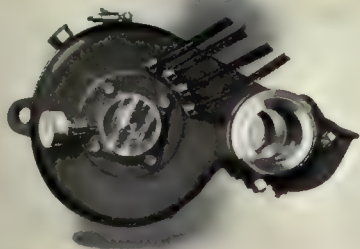
"GURNEYIZE YOUR ROAD"



goin' t' school yet?"—"Haven't you got any older children?"—"Yes, I've got a boy"—"How old is he?"—"He's goin' t' be sixteen next spring"—"Well, now he ought to read this book"—"No-o-o, he don't need one, he's got a book."

We are sorry that we cannot claim copyright for this story. We have been too busy making ball bearings and studying Electric Railway bearing problems. But we do claim the right to apply the lesson of this story to conditions which we find only too frequently. Of course, you have bearings in your journal boxes and motors. But are they the last word in economy, efficiency and service?

How much do you pay now for maintenance and inspection of journal and motor bearings? How much for relining those bearings and for repairing stripped and burned-out armatures? How many cars are laid up and out of

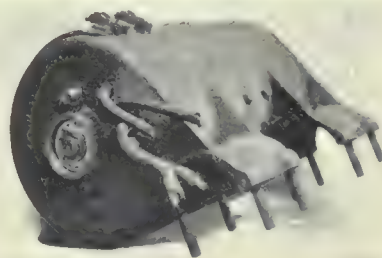
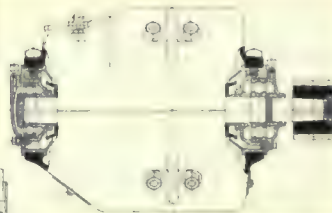
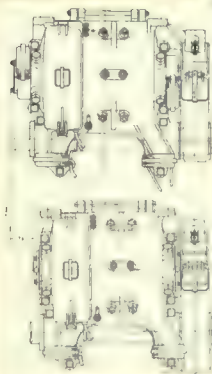


service every month because of trouble of this kind?

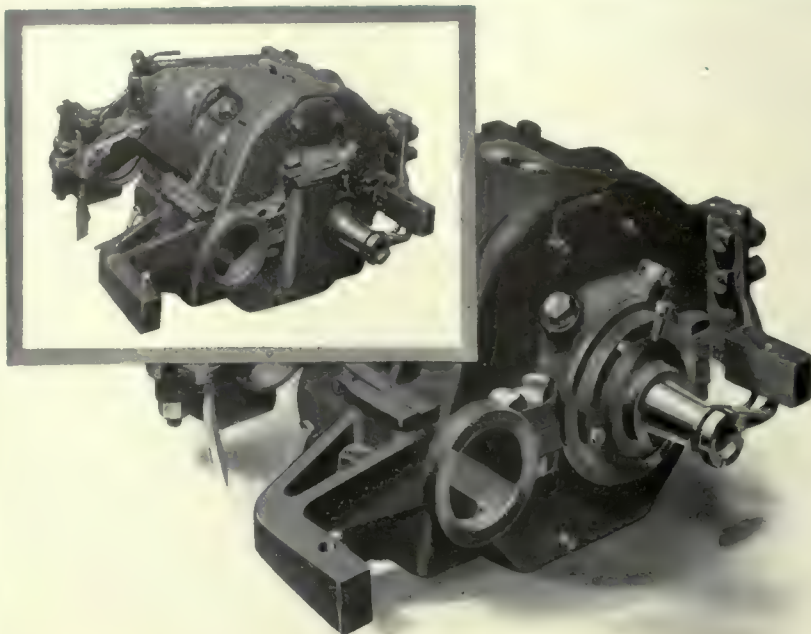
You may argue that plain bearings if given proper care cause no trouble. Let us forget for the moment the item of expense at which this could be accomplished. Is not the class of help available for this kind of work an exceedingly uncertain element on which to depend for the proper maintenance of your equipment under such exacting requirements?

Do you know that Gurney Bearings will run on a charge of lubricant *and stay in service* for weeks and months without requiring the least attention of any kind? Just stop to think how simple becomes your maintenance problem of to-day.

And then imagine hardly ever having to pull out a motor because of a hot box nor to have to change journal boxes for the same reason. Imagine



"GURNEYIZE YOUR ROAD"



having one man doing the work of three or four oilers and inspectors. Imagine all those cars running during rush hours which now are laid up and waiting for bearings to be re-lined. Imagine besides all this the great saving of current in operating these cars.

No, don't *imagine* these economies. Gurneyize Your Road and *have* them.

Don't say you've got a book.

GURNEY BALL BEARING CO.

CONRAD PATENT LICENSEE



JAMESTOWN, NEW YORK
CHICAGO, ILL.

NEW YORK CITY



ON EXHIBITION, SPACE 377-379

THE MATTHEWS-NORTHROP WORKS, BUFFALO, CLEVELAND AND NEW YORK

Service

You get more than simply BRAKE SHOES when you use our Product.

You get the advantage of our constant effort to improve our product for your service.

You get the earnest co-operation of our engineers to assist you in getting the full quota of service from each Brake Shoe applied.

Miles of service from the Brake Shoe are more to be desired than pounds of scrap.

All of which means increased efficiency and decreased cost of Brake Maintenance.

American Brake Shoe & Foundry Company

Chicago, Ills.

30 Church St., New York

Chattanooga, Tenn.

SMITH-WARD BRAKE

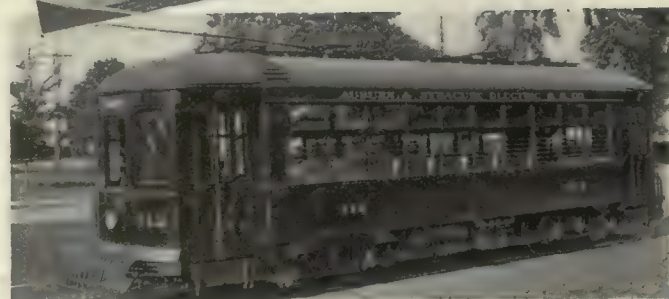
Some typical
installations of
S-W Shim
Slack
Adjusters



Bay State Street Railway



New York Municipal Railway



Empire United Railway of Syracuse

S-W Automatic Shim Slack Adjusters

Are extremely practical—they fit any truck. Extremely simple—just small metal shims which drop beneath the fulcrum of the brake lever and take up the slack. Their very simplicity makes them the more practical.

Their automatic adjustment of slack at the moment the slack occurs means:

Increased Safety in Operation

Reduced Carhouse Labor

Longer Life of Brake Shoes and Rigging

Mitigation of Irregular Wheel Wear

Reducing Flange Troubles

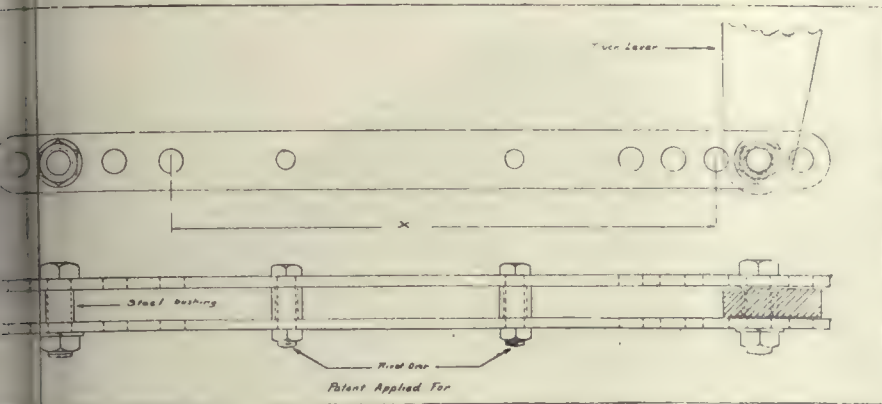
Let us prove it.

Smith-Ward

17 Battery Place

W. R. Kerschner Co., Inc., Eastern Sales

SLACK ADJUSTER



Some more
typical
installations of
S-W Shim
Slack
Adjusters

Union Traction Co. of Anderson, Ind.



The Connecticut Company



Wilkes-Barre & Hazelton Railway Co.

The Smith-Ward Brake Lever Strut

HAS

NO	{	Cotters	NO	{	Wear
		Loose Pins			Rattle
		Broken Pins			Lost Bushings
		Hardened Pins			Loose Bushings

Can be adjusted in $\frac{1}{2}$ " steps for
inches or more. Wear is trans-
ferred from pin to bushing.

Does away with multi-bushed
types. Only 2 bushings are needed.

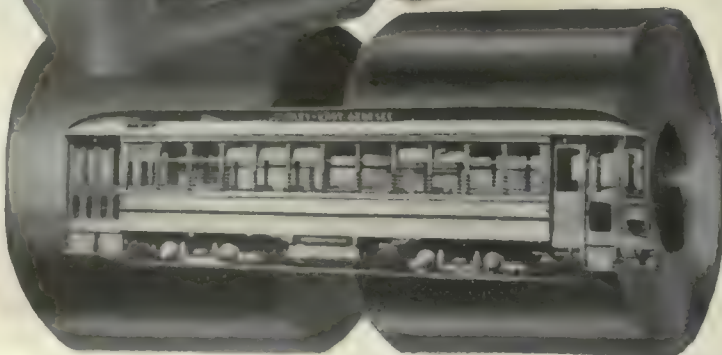
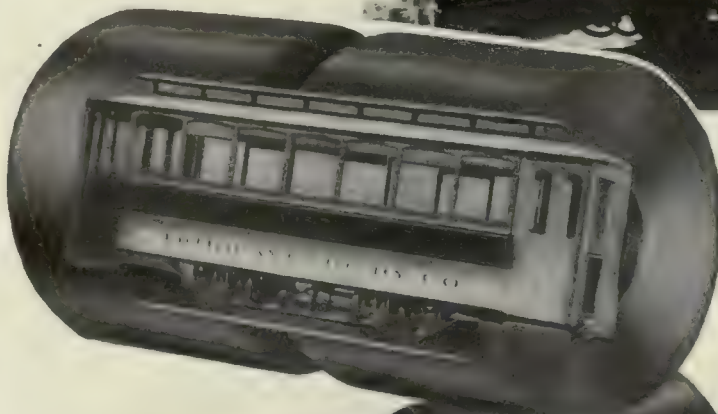
Cost, both original and mainte-
nance, is less. With S-W-B ad-
justers creates a Super-Ideal Con-
dition on Brill 27-G or Standard
D-50 Trucks. See it and the other
few S-W-B specialties in space 555,
Atlantic City, or get the folder by
mail.

ke Company

ew York City

W B. Adjusters, 50 Church Street, New York City

ROLLWAY



Pro In Every Ki

Rollway Bearing efficiency covers the gamut of railway operation from the slow speed, frequent stop, light weight car concourse of city service, to the high speed, few stop, heavy weight car operations of interurban operation.

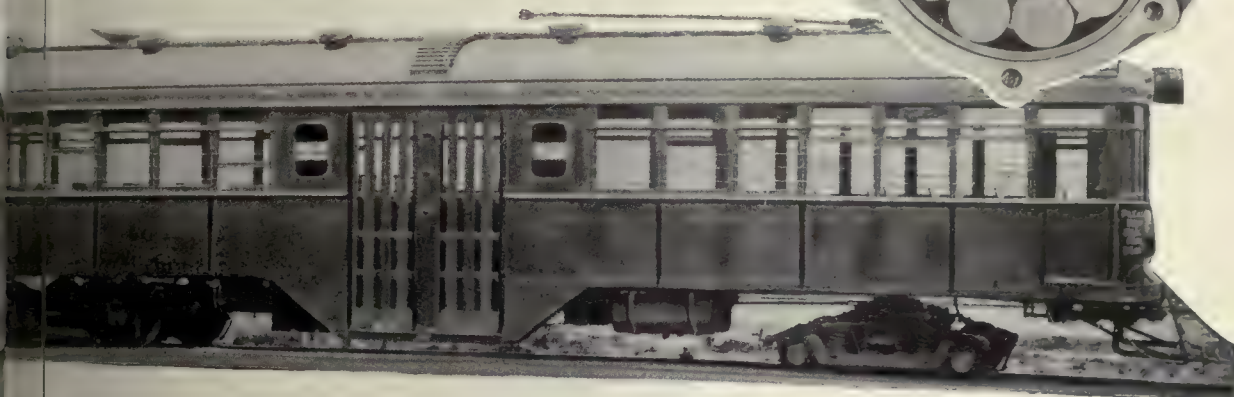
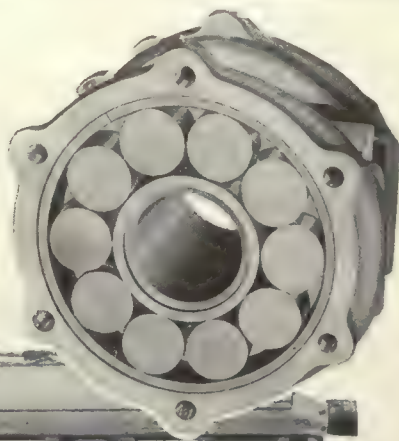
The savings which Rollway Bearings are effecting vary with the character of service, but in every case they are really worth while.

Rollway Bearings may save you from buying extra cars, they will raise the rate of circulation and thus permit better schedules.

The Railway

§ rac

BEARINGS



Efficiency Service

Railway Bearings will put off
costly increases in power plant
capacity. A 15% saving of
energy consumption is not un-
usual.

Railway Bearings will simplify
the problem of journal lubrication
and make hot boxes impossible.
They will reduce brake-shoe
wear too.

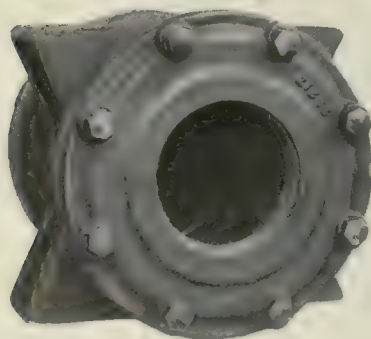
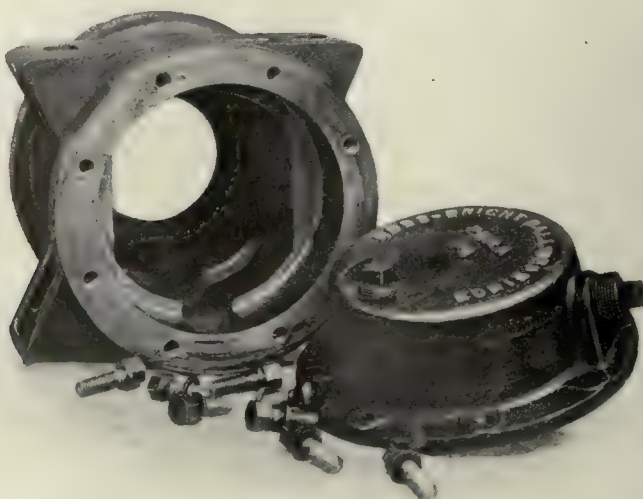
Railway Bearings are simple to
install, easy to maintain and help
keep the car on the line earning
money.

Ask us for the data sheet which
will enable you to order exactly
the right Rollway Bearing.

Rollway Bearing Co.
New York



All the Electric Railway World Will Say
HESS=BRIGHT Journals



The 400 Hess-Bright Ball-Bearing Journal Boxes for the new fifty Pay-Leave or "Car Rider" Cars of the New York State Railways—Rochester Lines—

Are now being installed on the Baldwin Type 62-18-C Arch-Bar Trucks selected for these cars.

Note that these Hess-Bright Boxes are going on a **standard** Baldwin truck—in fact they are absolutely interchangeable with Baldwin Type 37 Electric Trailing Boxes!

This interchangeability is characteristic of the Hess-Bright design for any modern truck! A little incidental machining of the axles is practically all the difference between the use of plain journals and Hess-Bright journals.



The Hess=Bright

Front Street and

Hess-Bright Conrad

Watching the Performance of These Boxes for Rochester!

¶ No need for you to duplicate Rochester's long and thorough tryout of Hess-Bright Ball Bearings.

¶ Go to it directly by asking us to submit a quotation to equip your present and your proposed cars with Hess-Bright Ball Bearings.

¶ If you'll answer these questions, we'll do the rest:

Weight of car empty, including brake rigging but excluding trucks.

Maximum number of seated passengers.

Maximum number of standing passengers.

Total weight of trucks, excluding motors.

Weight of motors and number per truck.

Assembly drawing (plan, front and side elevation) of a truck equipped with plain bearings.

Detail drawings of the axle, wheels and present journal box.

And remember that Hess-Bright Ball Bearing Journal Boxes can be designed to interchange with plain bearing boxes.

Manufacturing Co.

Philadelphia, Pa.

Thoroughly Adjudicated



Tough Stuff!

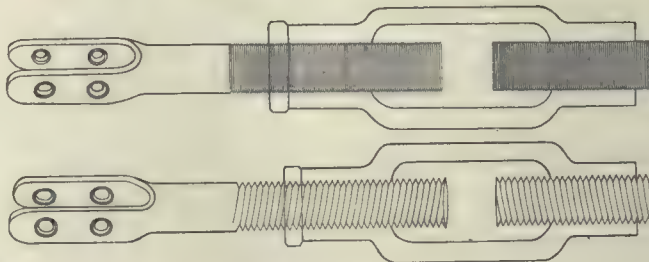


You'd have to wait too long to note the wear on **BOYERIZED PRODUCTS** if you installed them on your trucks today

So take a hammer, a saw, a file and a chisel and do your best to worst a Boyerized brake pin. It can't be done. Boyerized pins are tough all the way through and case hardened $1/16$ " deep. Smoothed to a true diameter, they will keep your trucks out on the line earning profits. There are 40 different sizes of them

in stock ready for prompt delivery to the railways who want the best pins for the least money. The same processes that made Boyerized pins such a great success are carried out in the manufacture of Bemis manganese brake heads, transom plates, center plates and body bushings.

The New Fine-Thread Bemis Turnbuckle



The Old Coarse-Thread Turnbuckle



Note the Difference Between
Old Thread and New!

We are now ready to supply a turnbuckle having more than twice the usual number of threads, thus assuring finer adjustment, minimum wear and greater strength for the same diameter rod.

Another most important advantage is that the nuts will stay tight once they are jammed.

BEMIS CAR TRUCK COMPANY Springfield, Mass.

Section

8

Rolling Stock

THIS section is devoted to the car and truck, more particularly to—

Recent All-steel Passenger Car Construction

Radial Axle Trucks to Allow Longer Single-truck Bodies

Electric Trucks for High-speed Service

And to latest designs for the better interchange of passengers and quicker fare collection.

We Will Help You



AGREEMENT

BETWEEN THE

GALENA SIGNAL OIL COMPANY of Franklin, Pa.
PARTY OF THE FIRST PART AND THE OTHER PARTY OF THE SECOND PART
WHO HEREBY AGREE TO THE FOLLOWING TERMS AND CONDITIONS
OF A CONTRACT MADE BY AND BETWEEN THE PARTIES
HEREIN.

When you make a Galena Contract, you unload your lubricating troubles on us, and we immediately supply you with the best oils for each service and take steps to eliminate all lubrication and allied troubles. Naturally, this results in a lower cost, and in any event our guarantee protects you.

Galena-Signal Oil Co.

Franklin, Pa.



United Traction Co. (Albany, N. Y.) Steel Cars 33' 4" long, successfully operated on TAYLOR E. H. SINGLE TRUCK 8' 0" wheel base, without END-OSCILLATION.

"Taylor-Made"

Trucks are *fitted* to your requirements

light in weight, strong in construction, simple in design, and properly proportioned.

They give easy and noiseless riding, prevent wear and side oscillation of cars, reduce maintenance, motor and wheel flange wear, and save power.

Every part of a Taylor Truck is readily accessible and simple in construction.

The brakes on a Taylor Truck will not chatter, and the Taylor E. H. Truck is absolutely non-teetering.

All Taylor Trucks are designed, built and inspected in our own shops from foundation framing to springs and journals.

Your inquiries for new or replacement work are solicited.

NOTE:—We carry in stock a large amount of wear and tear parts, and supplies for all types of Taylor Trucks, and make immediate shipment, thus obviating your investing in a large stock of supplies, as you are obliged to do with other makes. We also manufacture T.M.C. Steel Tired Wheels and TAYLOR MADE springs for all makes of Trucks. Let our shops be your stock room.

TAYLOR ELECTRIC TRUCK CO.

Established 1892

TROY, N. Y.



Storage Batteries in Electric Railway Service

LOAD REGULATION

For carrying peaks and fluctuations of load, especially in connection with water-power developments or where power is purchased on the basis of maximum demand, the "Chloride Accumulator", or the "Tudor Accumulator" is adapted.

LINE REGULATION

Due to the present high price of copper there are cases where the use of a battery for maintaining voltage is more economical than the purchase of copper for feeders. The "Chloride Accumulator" has been largely used in this service by many railways.

STANDBY SERVICE FOR EXCITER BUS

It is standard practice to install a storage battery connected to the Exciter Bus to prevent interruption in the supply of current for field excitation. Either the "Chloride Accumulator," the "Tudor Accumulator" or the "Exide" Battery can be used.

OIL SWITCH SERVICE

Storage batteries are used in power houses and sub-stations for the operation of oil switches and supplying current for pilot lamps and emergency station lights in case of failure of the power supply. For this service the "Chloride Accumulator," the "Tudor Accumulator" and the "Exide" Battery are used.

STORAGE BATTERY STREET CARS

For infrequent service or for conditions where trolley wires are prohibited, storage battery cars offer the most economical and profitable solution of the transportation problem. The "Hycap-Exide" Battery has been largely used in this service. In New York City alone there are in operation nearly 200 storage battery cars equipped with "Hycap-Exide" Batteries.

MULTIPLE-UNIT CONTROL

The "Exide" Battery and the "Tudor Accumulator" are used by a number of railways for furnishing a supply of low voltage current to be used in connection with the operation of multiple-unit control systems.

INTERURBAN CAR LIGHTING

A number of interurban electric railway companies have installed batteries on their cars to maintain steady illumination and to overcome fluctuations caused by changes in line voltage, interruptions in third rails at crossings and switches or by temporary failure of power supply. For this service the "Exide" Battery is particularly adapted.

HEAD AND TAIL LIGHTS

The "Exide" Battery is being used in connection with head lights and tail lights for furnishing current in case of interruptions in power supply.

Detail information on batteries for any of the above services can be secured from any sales office of the company.

THE ELECTRIC STORAGE BATTERY CO.

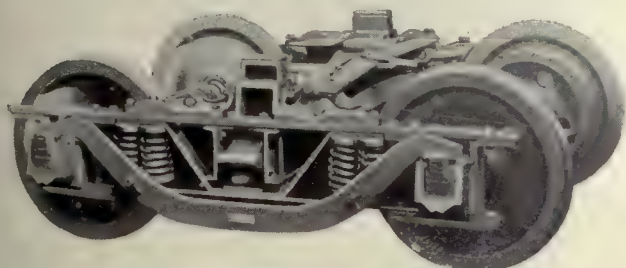
Manufacturer of

The "Chloride Accumulator", The "Tudor Accumulator",
The "Exide", "Hycap-Exide", "Tbin-Exide" and "Ironclad-Exide" Batteries

New York	Boston	Chicago	Washington	PHILADELPHIA, PA.	Rochester	Detroit	St. Louis
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BALDWIN

The equalized pedestal type of truck is the Baldwin standard for heavy electric railway service.



Class 73-18-K Truck for Binghamton Ry. Co.
Wheel-base, 73 inches. Carrying capacity, 22,000 lbs.

There are three principal classes of this type.

The "K", for suburban service;

The "A", for interurban service with medium weight cars.

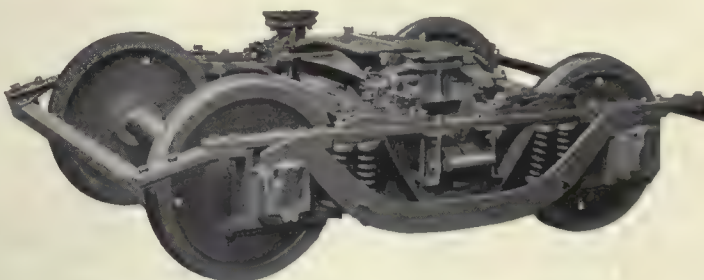
The "AA", for heavy high-speed interurban service.

Among the many excellent features of these trucks are the following:

Light weight in proportion to carrying capacity, combined with ample strength for the service requirements.

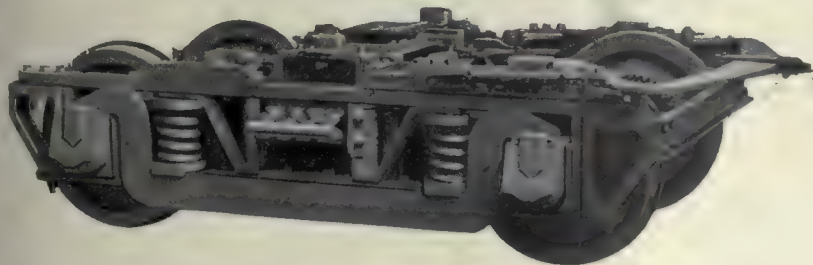
A rigid frame, reinforced by transom gussets so designed as to prevent "diamond pointing."

Superior riding qualities, secured by a combination of coil equalizing beam springs and full elliptic bolster springs.



Class 75-25-A Truck for St. Paul Southern Electric Ry. Co.
Wheel-base, 75 inches. Carrying capacity, 25,000 lbs.

All Baldwin trucks are built of tested materials, with the principal parts designed from a stress diagram, and held together by turned bolts in reamed holes. The brake work parts are bolted together, instead of pinned; and the bolts are fitted



Class 96-50-AA Truck for Michigan Ry. Co.
Wheel-base, 96 inches. Carrying capacity, 50,000 lbs.

with compression springs to prevent chattering. The work throughout shows the same thoroughness that characterizes Baldwin locomotive construction.

THE BALDWIN LOCOMOTIVE WORKS

PHILADELPHIA, PA.

REPRESENTED BY

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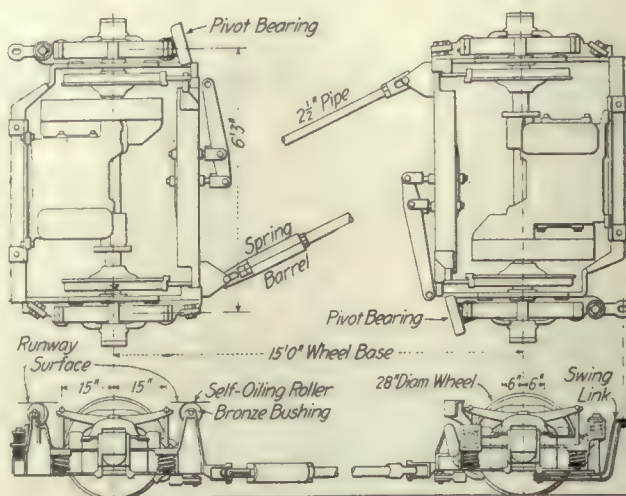
Charles Riddell, 627 Railway Exchange, Chicago, Ill.

C. H. Peterson, 1210 Boatmen's Bank Bldg., St. Louis, Mo.

George F. Jones, 407 Travelers' Building, Richmond, Va.

A. Wm. Hinger, 722 Spalding Building, Portland, Ore.

Williams, Dimond & Co., 310 Sansome St., San Francisco, Cal.



GENERAL LAYOUT OF TRUCK

Our Radial Trucks are unequalled by any other flexible truck for lightness, simplicity, length of wheel-base, and conformity in details to Association standards.

Particulars gladly furnished.

Philadelphia Holding Co., 505 Chestnut St., Philadelphia



One of fifteen new Jewett Steel Cars

Ordered by the Northern Ohio Traction & Light Co.

Seven of them have baggage compartments—eight have smoking compartments. All have spacious white enameled saloons with running water, etc. Pressed steel posts—steel plates throughout—steel grained mahogany interior finish—chanarch and composition flooring with battleship linoleum in aisles—these are some of the details of these "cars of character."

Let us bid on your specifications.

THE JEWETT CAR CO., Newark, Ohio



Crane Runway for Rail and Water Connections

LACONIA

A Modern Plant for Modern Cars

You are invited to examine these pictorial proofs of our ability to produce to your satisfaction any type of modern electric rolling stock from the simple body or truck to the completely equipped car ready to run.

You are also invited to note that these facilities are at your disposal for the manufacture of anything you may require in wood or metal car details.

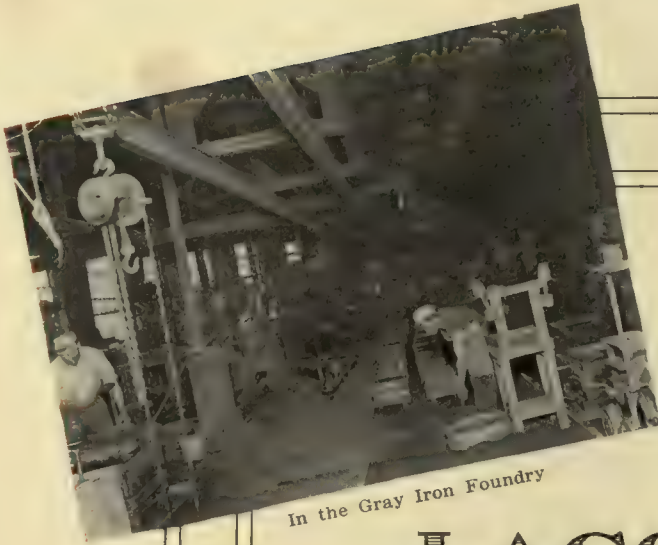
LACONIA CAR COMPANY

EXECUTIVE OFFICES,
BOSTON, MASS.

WORKS,
LACONIA, N. H.

A Portion of the Fabricating Shop





In the Gray Iron Foundry



In the Malleable Iron Foundry

LACONIA

Facilities for Car Supplies

A Battery of
Air Furnaces

Both our gray iron and malleable iron foundries are of ample capacity to handle outside work expeditiously in addition to that for car orders. Brake rigging, brake-shoe hangers, truck parts, bolsters, truss rods, window grills, etc., are standard products of our foundries and forge shop.

A "One-Man"
Pour

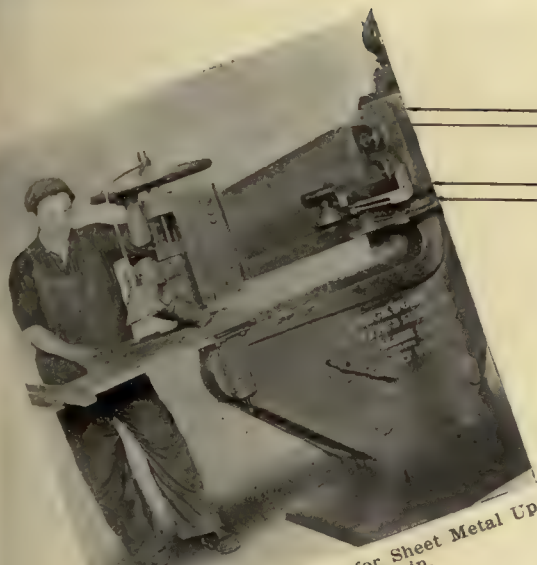
Making a 400-Pound Pour



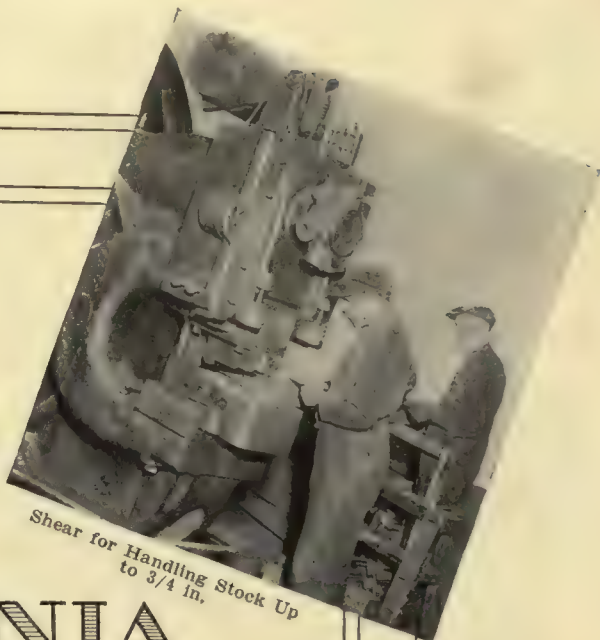
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Rotary Shear for Sheet Metal Up to 3/16 in.

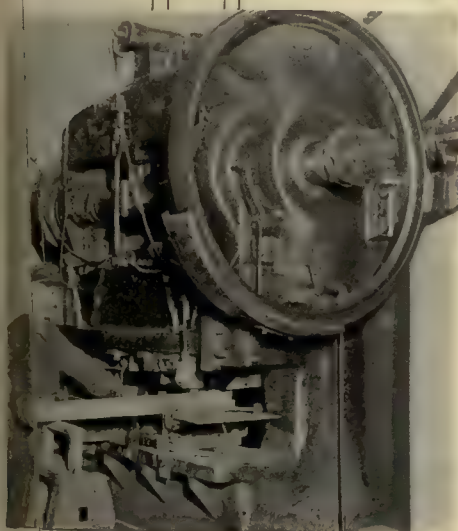


Shear for Handling Stock Up to 3/4 in.

LACONIA

Facilities for Steel Cars

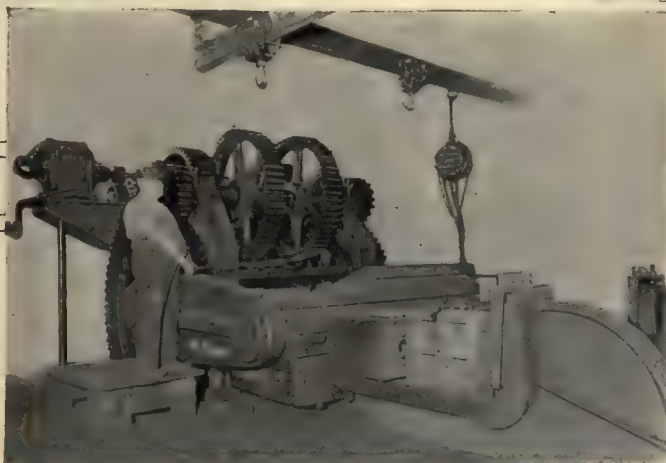
These machine tools are typical of the modern apparatus used by this Company for the accurate and efficient construction of steel cars. The bulldozer is the largest of its kind, while the machine for coping is but one example of Laconia up-to-date shop equipment.



Coping Machine for Plates and Structural Work



Press for Forming Steel Shapes and Moldings



"King Solomon," the 500-Ton Bulldozer

LACONIA CAR COMPANY
EXECUTIVE OFFICES
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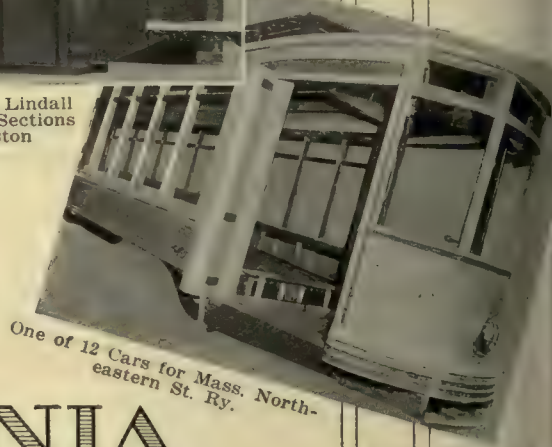




Two of 102 Lindall
Articulated Sections
for Boston



One of 20 Center-Entrance Trailers
for Boston



One of 12 Cars for Mass. North-
eastern St. Ry.

LACONIA

Cars in the Making



One of
5 Underframes
for Holyoke

During the first nine months of 1916 this Company has received orders for nearly 500 electric cars and over 300 sets of trucks.

These orders represent almost the entire range of service—for end-platform motor cars, center-entrance trailers, center-entrance motor cars and for Lindall articulated sections.

We solicit your patronage in the knowledge that we have both the means and the will to give you the best obtainable in car design and construction.



Underframe
and Side Frame
for Albany



One of 3 Laconia Center-Entrance Motor Cars for Bangor

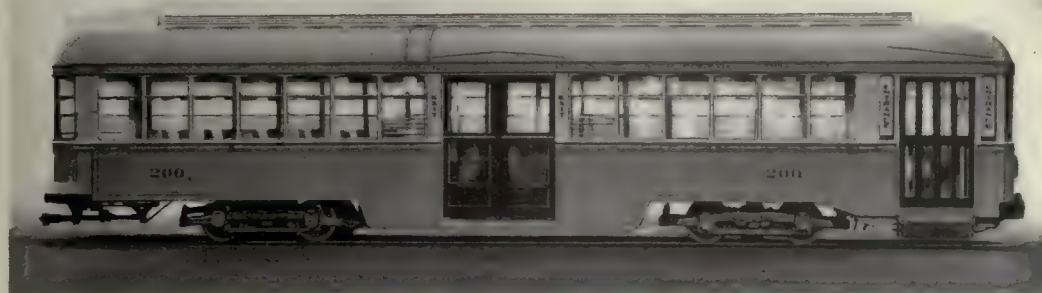


LACONIA CAR COMPANY
EXECUTIVE OFFICES
BOSTON, MASS.

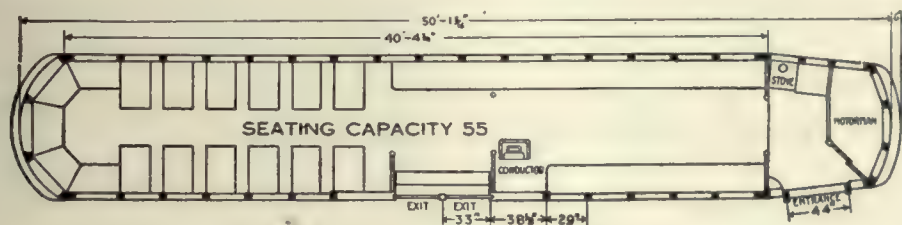
WORKS
LACONIA, N.H.



The Car Rider's Car



SIMPLY a front-entrance, center-exit car with the conductor at the center collecting prepayment fares from passengers who pass him and go to the rear and collecting fares from those in the front section as they leave the car. No waiting on the platform or in the street for passengers ahead to pay their fares. No holding up of the entire line by large groups of passengers at busy points passing one at a time into the cars and paying their fares as they



enter with many delays due to getting change, transfers, tickets, and having their questions answered. Passengers board the car two at a time with no holdup and under the eye of the motorman who controls the entrance by his control of the folding doors and step. In less than half the usual time all are aboard and while the loading is swiftly progressing in front unloading is going on at the center exits.

One hundred and fifty-six of these cars are in operation in Cleveland. Sixty are being built for Toledo, fifty for Rochester, twenty-five for Syracuse, ten for Utica and ten for Schenectady.

PETER WITT, 630 Leader Building, Cleveland

St. Louis Car Company

Light-weight Units have come to stay. We have designs for single end and for double end operation. We have built light-weight cars with various methods of door operation. Weight of St. Louis Light-weight Units range from 10,000 lbs., to 14,000 lbs., complete. A sample of our "Bantam" car and truck can be inspected at the Convention.

Don't fail to see it.

St. Louis Car Company



Steel Cars

First for Safety and Traffic Promotion

Three hundred and fifty thousand pounds (350,000 lbs.) is the approximate weight of this three-car train when carrying its full load of 180 seated passengers.

Sixty miles an hour (60 m.p.h.) is the rate of speed at which this train is propelled over most of the 63-mile run.

Between Los Angeles and San Bernardino

This is the latest and best-equipped line of the Pacific Electric Railway. It was built not only to bring San Bernardino into closer touch with Los Angeles, but to attract high-class tourist travel.

The twenty-five (25) steel cars which we have furnished for this magnificent line have now been in operation almost a year, giving that safety and comfort that spell BETTER BUSINESS and a Pleased Public.

Write our nearest office about your needs in non-burning, non-telescoping cars.

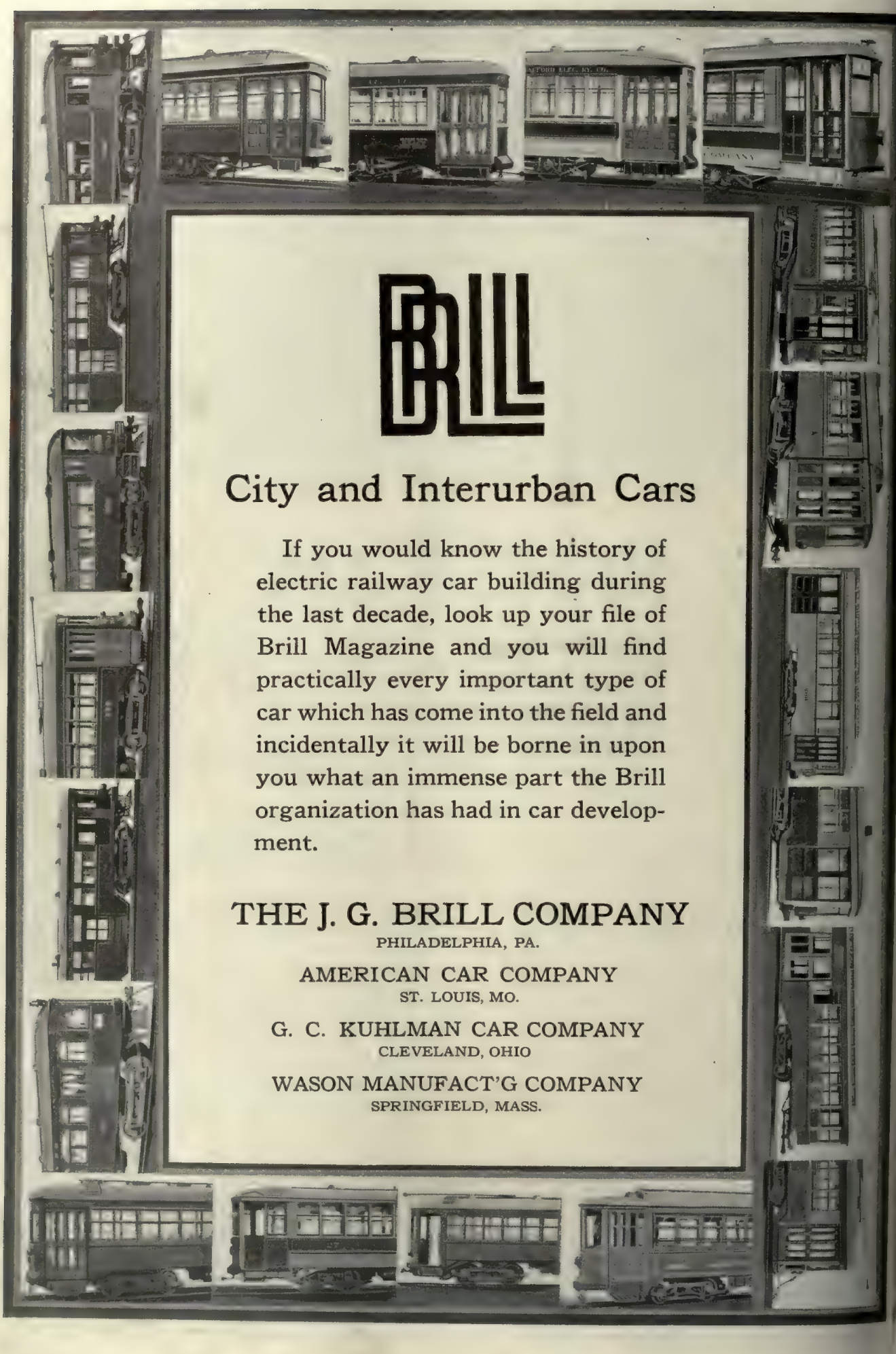
Pressed Steel Car Company

New York

Pittsburgh

Chicago

Washington, D. C.



BRILL

City and Interurban Cars

If you would know the history of electric railway car building during the last decade, look up your file of Brill Magazine and you will find practically every important type of car which has come into the field and incidentally it will be borne in upon you what an immense part the Brill organization has had in car development.

THE J. G. BRILL COMPANY

PHILADELPHIA, PA.

AMERICAN CAR COMPANY

ST. LOUIS, MO.

G. C. KUHLMAN CAR COMPANY

CLEVELAND, OHIO

WASON MANUFACT'G COMPANY

SPRINGFIELD, MASS.

BRILL

Car Trucks and Specialties

As for truck development—the modern single-motor type and the “Radiax” among other Brill trucks; the Graduated Spring System, the Bolster Guide, the Side Swing Dampener, the Half-Ball Brake Hanger, and other features have been introduced in recent years and together they mark the progress of safety, easy riding, and the reduced cost of maintenance.

THE J. G. BRILL COMPANY

CABLE ADDRESS: “BRILL” PHILADELPHIA

LONDON OFFICE; 110 Cannon St., E.C.

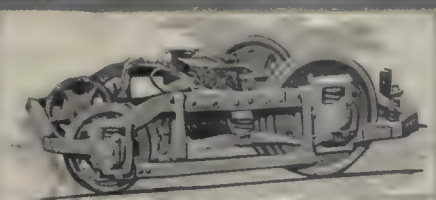
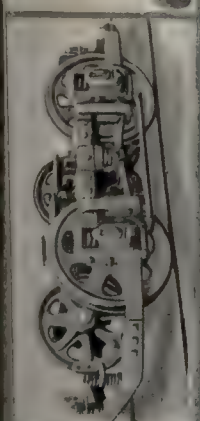
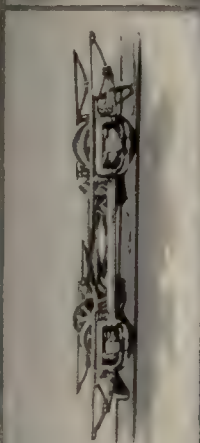
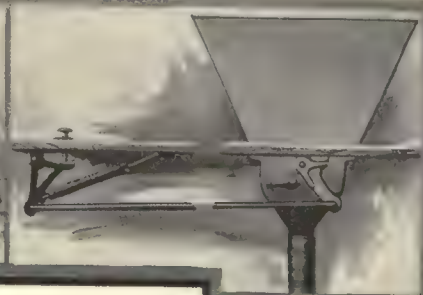
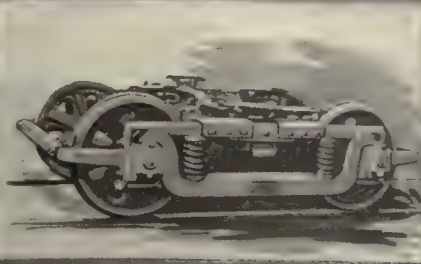
CABLE ADDRESS: “AXLES” LONDON

CIE J. G. BRILL, 49 Rue Des Mathurins, PARIS

CABLE ADDRESS: “BOGIBRIL” PARIS

AGENCIES IN

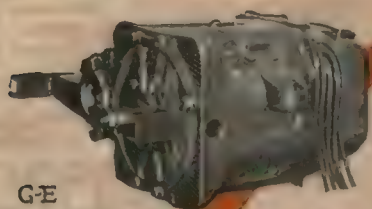
BELGIUM, HOLLAND, ITALY, AUSTRALASIA, ARGENTINE,
URUGUAY, NATAL, TRANSVAAL and ORANGE RIVER COLONY



The G-E Ventilated Railway Motor

was first introduced at the 1911 Atlantic City Convention.

It was a pioneer then; it is the standard of excellence for the entire range of electric railway operation now.



G-E
Ventilated Railway
Motor used on
one-man cars



G-E Ventilated Railway
Motor used on the
Chicago, Milwaukee
& St Paul Locomotive

General Electric Company

General Office:
Schenectady, N.Y.



Sales Office: in
all large cities

ELECTRIC RAILWAY JOURNAL

Published by the Electric Railway Publishing Company, Inc.

October 1, 1927

Twenty Cents per Copy

Get more for your money!

THERE is no surer way to get the real facts about tire performance than from the experience of operators who keep accurate mileage records.

Such records kept by motorcoach operators in every part of the country show that the U.S. Royal Cord Motorcoach Tire is consistently delivering low cost-per-mile service.

This indicates the advantage of a tire specifically built for bus and motorcoach service.

United States Rubber Company

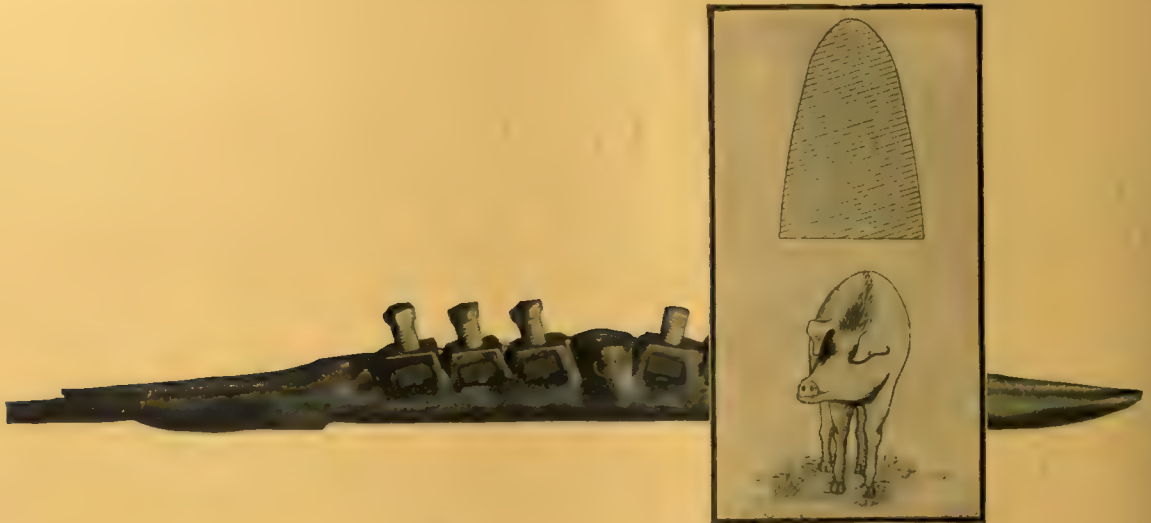


U.S. Motorcoach Tires

ROYAL CORD

Built for "Lowest Possible Cost per Tire Mile"

HOUSTON PUBLIC LIBRARY,
HOUSTON, TEXAS.



The *Razor Back* (RB) Trolley Splicer



Keep Your
Overhead Down
by
Keeping it UP
with
Westinghouse
Rocking Nuts

THIS new Westinghouse splicer has an under-run shaped like a razor-back hog—hence its name, RB.

Because of its tapered shape, coming to a rounded point at the bottom, the RB splicer rides on the bottom of the groove in the trolley wheel. Wear is almost entirely confined to rolling friction. Of grinding friction where the splicer rubs against the side of the wheel there is very little on tangent track.

Burning also is reduced—by the smooth under-run that is almost as smooth as plain wire. The complete transition takes place on a straight line.

The RB splicer is easy to install. Wires are inserted without bending. A pair of pliers is sufficient to tighten the set screws with rocking nuts. And how those rocking nuts do hold! Increased tension on the wire just makes them hang on tighter.

Westinghouse Electric & Manufacturing Company
East Pittsburgh Pennsylvania

Sales Offices in All Principal Cities of
the United States and Foreign Countries



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Polishing the Diamond

EVERY facet in the diamond accentuates the brilliancy of the stone. Together they represent the work of a skilled artisan who with pride has devoted his talent and energies to bringing out to the utmost the beauty hidden in the precious jewel.

To the observer the great luster dazzles the eye. Not until a close inspection is made can each part be seen and a true concept be gained of the part contributed through the lapidary's skill.

Every vital phase of the Cleveland convention exhibits, reports, addresses, and conferences contributes to the making of a clear picture of the industry.

As it is necessary for the observer of the jewel to grasp the component parts of its completed beauty, so it is necessary for members of the A.E.R.A. to study all of the important phases of the convention both at Cleveland and after they return.

Like the skilled artisan, the JOURNAL, with the lapidary of analysis and thought, will endeavor to bring out distinctly in its dailies and report numbers every facet of the Cleveland convention.

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The
**Turning
Point**

in street car service

**has
arrived**

Another

See Them
at the

A.E.R.A.
Convention

W-N

Drive

and

Worm Gear Drive

Westinghouse

Westinghouse Achievement !

*Quieter running... Faster acceleration...
Higher schedule speeds... Lighter weight
... in street car service —*

WESTINGHOUSE, ever in the lead in transportation engineering achievements, has cooperated with the Chicago and Joliet Electric Railway and the Springfield Street Railway Company in the development of worm drive motors.

These motors have aroused nation-wide interest in the possibilities for marked advances in street car service.

In addition, Westinghouse engineers, working in cooperation with car builders, have now developed the "W-N" drive for street cars.

This Westinghouse achievement will unquestionably go down in traction history as the turning point in placing the street railway industry in the forefront as the most efficient form for comfortable, safe, rapid and reliable passenger service.

Westinghouse Electric & Manufacturing Company
East Pittsburgh, Pennsylvania
Sales Offices in All Principal Cities of
the United States and Foreign Countries



1927



house



Seal of the
City of Cleveland

Cleveland

The Fifth City

ON the southern shore of Lake Erie stands a great industrial city, towering like a super-monument to its founder, General Moses Cleaveland.

It was in 1796 that Cleaveland's little band of pioneers selected the site for a settlement on Lake Erie at the mouth of the Cuyahoga River and surveyed the township of Cleveland, one mile square, overlooking the lake.

The little village developed slowly at first. Handicapped by hardship and suffering, it was not until 1852 that her ship came in.

That year the Baltimore, laden with the first cargo of iron ore from the Lake Superior region, entered Cleveland harbor.

If this cargo had been gold instead of iron, it could not have done more for the embryo city. Situated as she is on the Great Lakes at the logical and most economical meeting point of shipments of iron ore, coal and limestone, she soon became a great producer of iron and, as a result, started doubling her population every ten years.

With her production of iron she built machinery and ships to carry the iron ore and coal to make more iron until her

smelters have reached the enormous capacity of 3,000,000 tons a year.

When the dawn of the twentieth century brought us the automobile, Cleveland was the first city to grasp its possibilities and develop them.

Reaching out in other directions, she is crowding New York for first place in the cloak and suit industry. Ten million gallons of paint, valued at \$40,000,000, and more than 300,000,000 bricks and 200,000 tons of hollow tile are made in Cleveland every year.

Her progressive spirit has extended even into politics. In 1923 Cleveland adopted the City Manager form of government, a community fund for all charitable purposes, and a beautiful group plan of public buildings on the lake front.

But her outstanding achievement is the progressive development of the Cleveland Railway Company. The city participates in the control of the service, operation and maintenance.

A super service at the lowest actual cost to the riders is the aim of the management. In attaining this end, more than fifteen hundred Westinghouse-equipped cars of the modern types are operated over the 400 miles of track Westinghouse accomplishments in advanced designs and in the manufacture of all transportation equipment is always in step with progressive street railway management.

Westinghouse Electric & Manufacturing Company
East Pittsburgh Pennsylvania

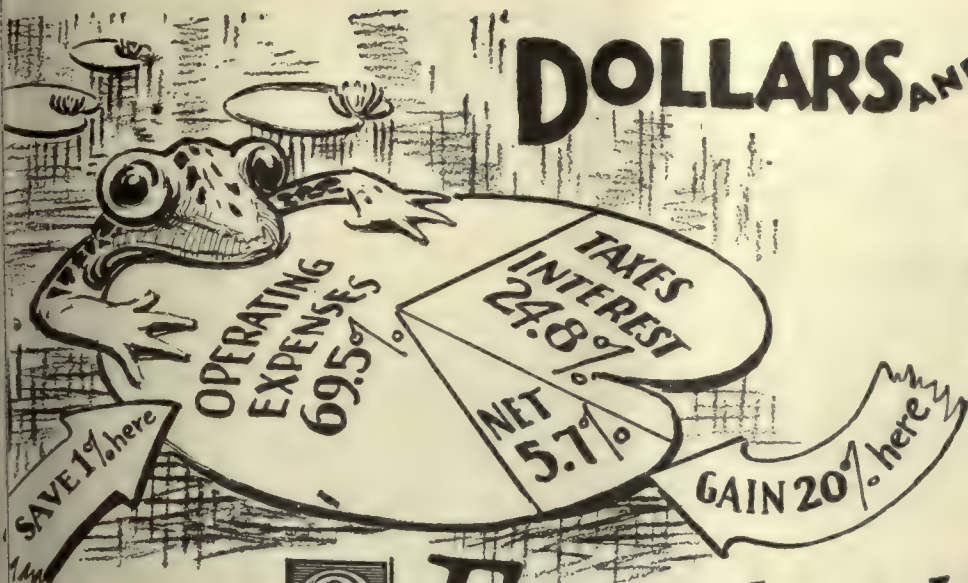
Westinghouse



X93664

DOLLARS AND SENSE!

Provide net income for the future by building endurance and permanence into overhead lines now. Statistics of the industry show that a 1% saving in operating expenses will increase the average net income nearly 20%. And it's the many small savings, easily made, that help most to swell the net.



Frogs take a bite out of operating expenses!

AND no wonder! It is not unusual for an O-B Type BC Frog to be in service after 500,000 car passes! The average of tests on five large electric railways was close to the half million mark! Can you say as much for the type of frog you are using?

The big reason for O-B Type BC Frog longer life is in the runner extensions, close to the center, which prevent the wheel flanges from running on the pan. There's no jump, no arc, but rather, an easy, *smooth* transition all the way through, on the straight or on the turnout runner.

Your trolley frog replacements will be fewer and farther between, if O-B Type BC Frogs are used. It will help to save that one percent in operating expenses, which means nearly 20% more for net!

May we send you complete details? Address

Ohio Brass Company, Mansfield, Ohio

Dominion Insulator & Mfg. Co., Limited

Niagara Fall, Canada

706B



O-B Cam Tips (Renewable Bronze)

Are provided on all modern O-B Frogs, Cross-Overs and Section Insulators. They hold the wire tightly, never become loose or troublesome in service, afford a smooth transition from wire to casting, and are easily and quickly renewed when worn.

Ohio Brass Co.



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CHICAGO

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BETTER RAIL, BETTER TRANSPORTATION

Take the first step FIRST

One road after another is proving that improved service, decreased expense and improved net go hand in hand.

Most of the successful rehabilitations have shown, too, that track reconditioning is the logical start.

No matter how much or how little you plan to do toward improving service, take the first step first—rejuvenate your rail.

With the modern equipment shown here it costs little to grind out corrugations, build up and grind low joints and repair battered special work.

And it pays—handsomely!

*Evidence? Bulletins?
Quotations? Say the word.*

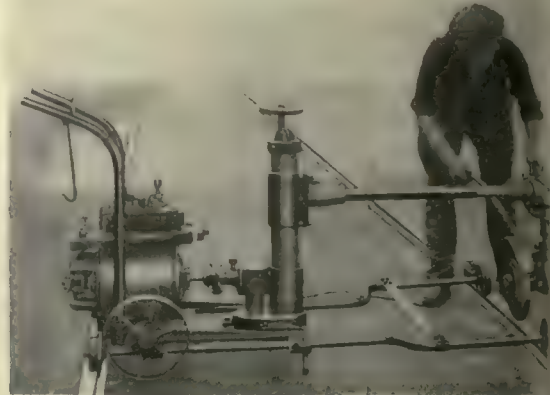
Railway Trackwork Co.

3132-48 East Thompson Street, Philadelphia

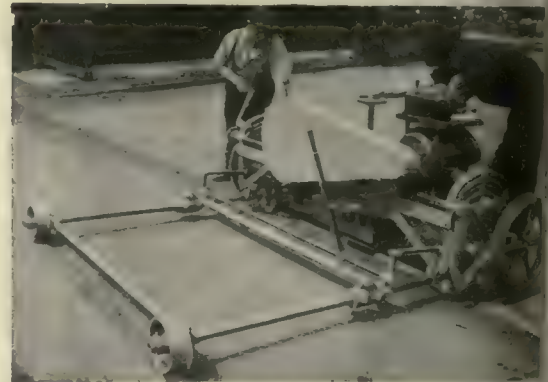
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1821



Eureka with Outrigger for open track.



"Vulcan" Rail Grinder



Reciprocating Track Grinder



"Ajax" Electric Arc Welder

BETTER RAIL, BETTER TRANSPORTATION



TAKING everything into consideration, a dollar will pay for a certain amount of paved track construction.

When wood ties and hand laying methods are used—that dollar shrinks up quite remarkably.

When Steel Twin Ties are used, together with modern labor saving machinery (that we have especially developed)—that dollar s-t-r-e-t-c-h-e-s out and covers a lot more territory.

And the Twin Tie job is much better in every way—for it stretches the dollar in actual construction costs—and then it stretches it out year after year—as the cars roll merrily by.

Which dollar are you spending?

SPACES

300	302	304
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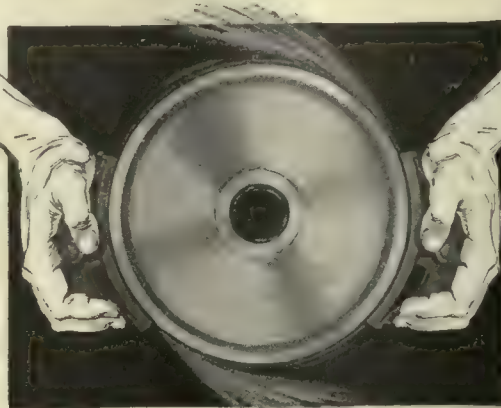
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THE INTERNATIONAL STEEL TIE CO.
CLEVELAND, OHIO

Look it up in your "Paved Track Note Book"

Steel Twin Tie Track

TWIN TIES ARE ALL STEEL

**Balanced****Braking**

Double the Braking Area—

Double it—and you decrease over 50% the required energy absorption per brake shoe.

Double the braking area and you greatly increase the friction coefficient.

Double it and you can attain a higher rate of retardation.

Double it and you decrease the frequency of brake shoe replacements.

The "SIMPLEX AND AMERICAN MULTIPLE UNIT" clasp brakes with two brake shoes per wheel instead of one, doubles the braking area and accomplishes these results.

AMERICAN STEEL FOUNDRIES

NEW YORK

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American Multiple Unit Clasp Brake





KEYSTONE STEEL GEAR CASES

If a malleable iron case hits an obstruction in the road or if the lower half drops, it may derail the car or break the motor frame.

A Keystone Steel Gear Case will merely bend and buckle and the car will ride by. Then the case can be taken to the shop and pounded back into shape. If too badly smashed it is a simple matter to replace the lower half at small expense.

The steel that goes into Keystone Gear Cases is a soft, open-hearth, deep drawing steel. It is tough enough to protect the gear and pinion—has body enough to absorb all vibrations—and is flexible enough to bend and buckle so as to prevent serious accident as mentioned above.

The Keystone Steel Gear Case is both riveted and welded, the rivets hold the sheets together—providing the necessary tensile strength. The spot-welds unite the sheets at the welds into a homogenous mass—preventing the sheets from slipping one upon the other. By staggering the rivets and the welds all the advantages of both methods are obtained without the disadvantages of either method.

The halves of any given type of Keystone Cases are interchangeable. This insures perfect fit before they leave our shop and also enables you to replace either half if it becomes irreparably damaged.

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ST. LOUIS CAR COMPANY
St. Louis, Mo.

St. Louis Car Co.





Door and Step Equipment Contributes to:

SPEED

- 1** Facilitates fare collection.
- 2** Educates patrons as to fastest boarding and alighting methods.
- 3** Speeds passenger interchange.
- 4** Reduces standing time of cars.

SAFETY

- 1** Provides proper height of step.
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- 5** Provides safe signalling systems.
- 6** Assures proper operation of doors and steps.

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EARNINGS

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PACKING CUPS
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It was Natural

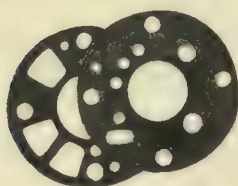
that the originators and producers of the air brake should strive to perfect every detail of air brake apparatus.

that dependable and durable packing cups and gaskets be recognized as essential in preserving the integrity of air brake devices by reducing leakage.

that years of research and experiment be spent in developing materials superior to the rubber and leather products previously used.

that, with intimate knowledge of air brake requirements and ample resources at hand, there be produced the superior composition known as "WABCO."

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Balanced Design are
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Automatic Signals by providing proper spacing of cars or trains, reduce trip time and enable more cars to be operated with consequent safety.

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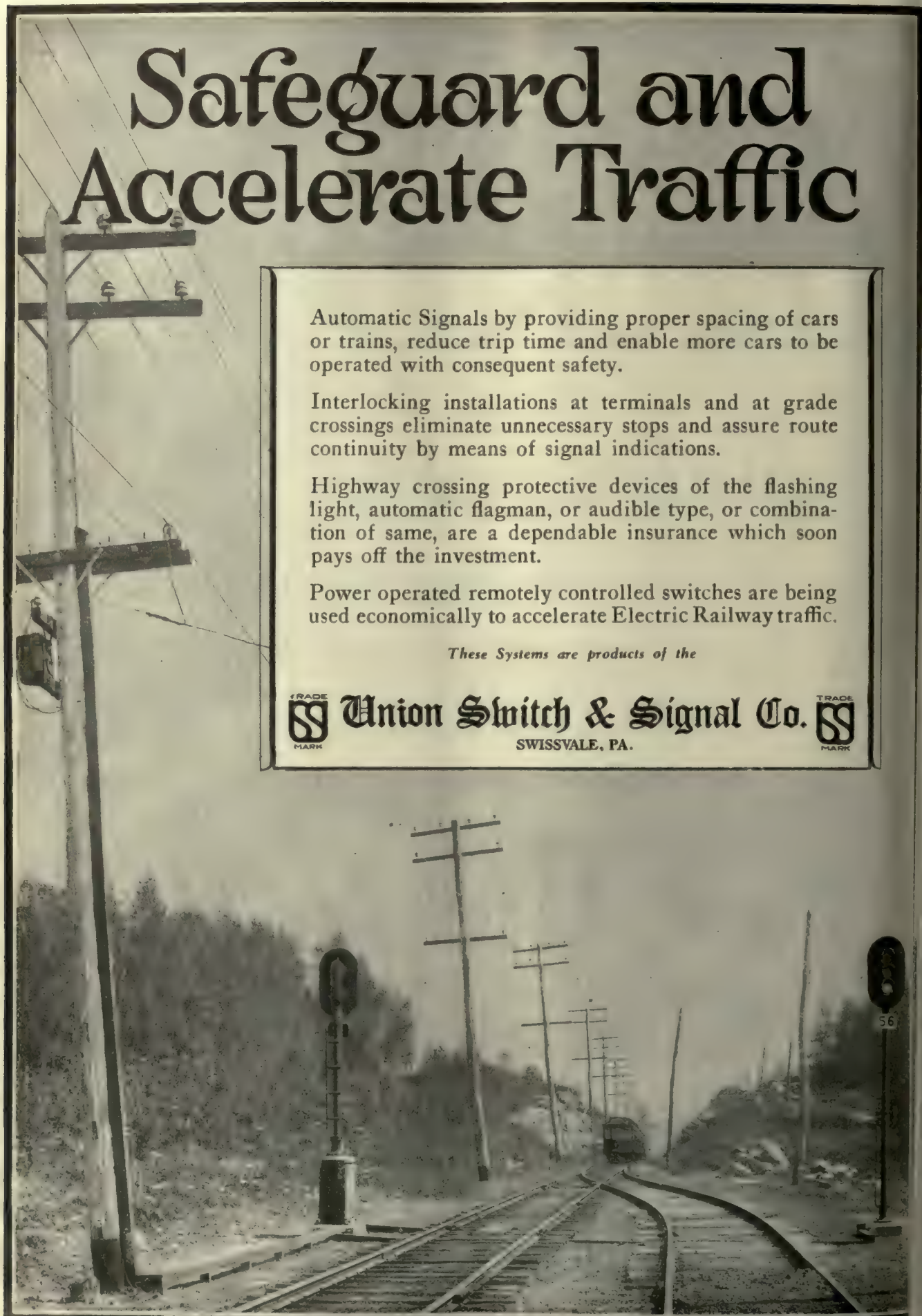
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These Systems are products of the



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HERE IS an accurate, rugged device which will induce savings. It measures the engine fuel as used and registers the amount.

Individual fuel consumption records, by men and by vehicles, afford the transportation and mechanical departments a simple means for gaining worth-while fuel and equipment savings.

The ECONOMY Gasoline Vehicle Meter is inseparably linked to economical and safe operation.

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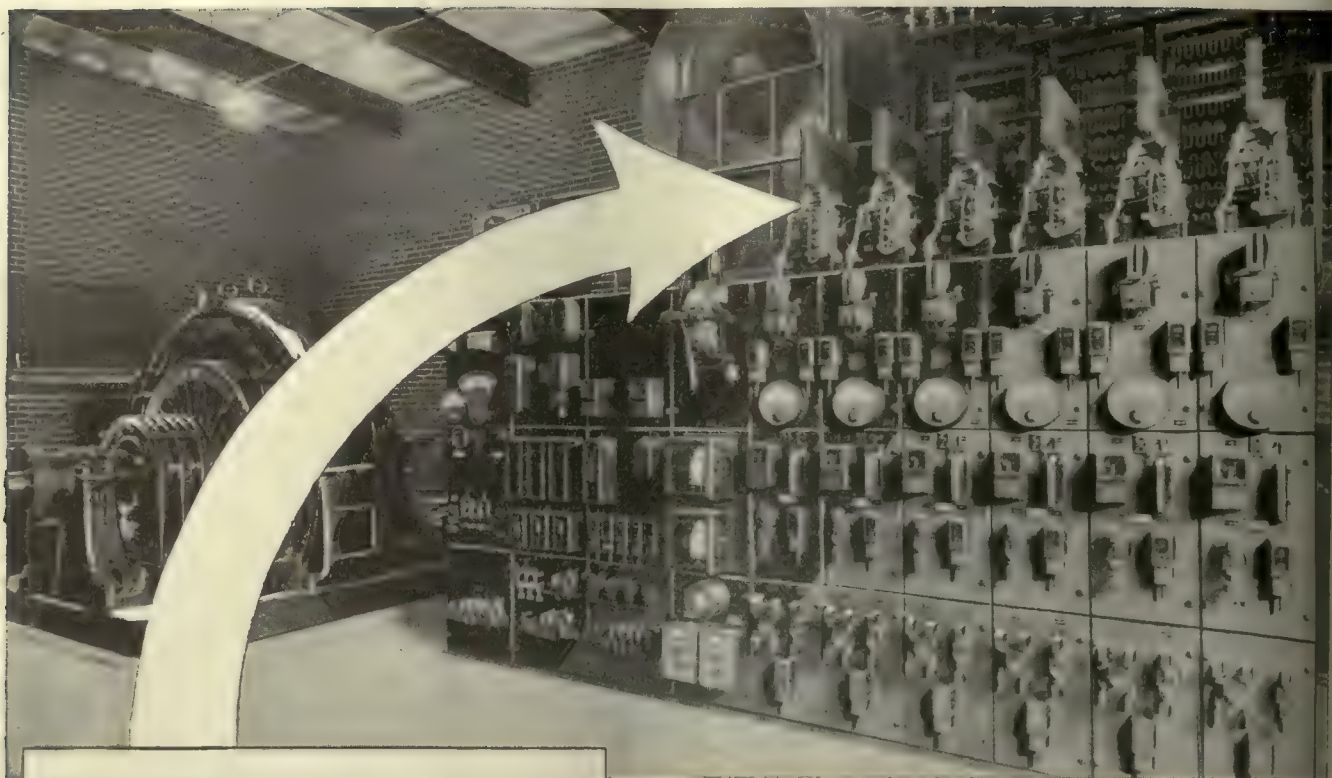
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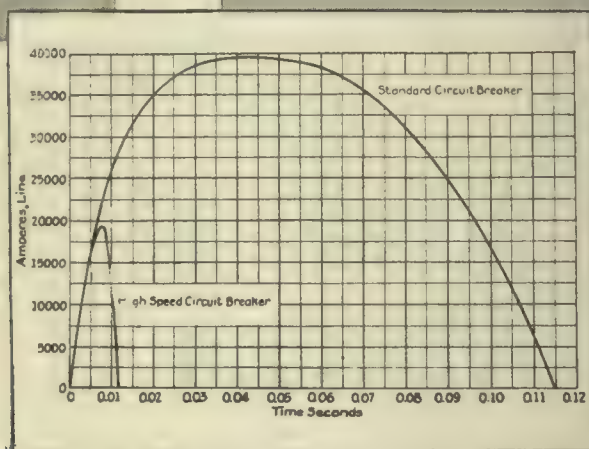
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Franklin Ave. Substation, United Railways of St. Louis



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Bulletin GEA-720 describes the G-E high-speed breaker. Your G-E Office has copies.

GENERAL ELECTRIC

Electric Railway Journal

Consolidation of Street Railway Journal and Electric Railway Review

Published by McGraw-Hill Publishing Company, Inc.

CHARLES GORDON, Editor

Volume 70

New York, Saturday, October 1, 1927

Number 14

New York Gets Another Transit Report

NEW YORK has another transit report. This time it is Mr. Untermyer, special attorney for the Transit Commission, who presents to that body an elaborate plan which purports to outline a method for unscrambling the transportation mess in the country's metropolis. Of course that is no simple job. It is comparatively easy to stand back and criticise almost any scheme which is suggested for straightening out the tangle of politics, prejudice, physical difficulties, finances, personalities, self-interest and public ignorance involved in the New York transportation problem.

There is no intention here to analyze Mr. Untermyer's report in detail. The electric railway industry generally is little interested in the complicated legal, physical and financial scheme which is proposed. Suffice it to say that the report does not seem to put foremost the most important need, i.e., for more transit and better riding conditions for the millions of people who daily depend on its inadequate and distorted jumble of transportation lines. The word "jumble" is used in preference to "system," for by no stretch of the imagination could the latter even be made descriptive of the conditions which exist.

What the report seems to try to do is to find a way of utilizing the new subway lines to the construction of which the city is committed, and at the same time avoid the necessity of charging a rate of fare that will make these lines self-supporting, in accordance with the provisions of the law authorizing the city to undertake the construction of an independent subway. As a political expedient, this seems to be an astute move. First, the city was committed by its officials to the construction of this subway. They succeeded in inducing the Legislature to authorize it only by writing into the law the provision that the system must charge a rate of fare sufficient to make it self-supporting. If that program were permitted to go into effect, there would be presented to the intelligence of the voters the anomalous situation of privately operated subways required to charge 5 cents, while a city subway charged 8 or 10 cents for a ride. Obviously many can ill afford to permit such a situation to develop. Now that the city system is well under construction, therefore, and before the people shall fully realize the blundering of its officials, Mr. Untermyer starts out to rescrumble the situation, so that by dissecting the present transportation systems and taking from them the cream of their routes, the city may obtain a group of lines which will show some possibility of being operated on a 5-cent fare. What is to happen to the remnants of the private companies thus dismembered seems to be of small concern to Mr. Untermyer. In fact, one is led to believe from the report that if he had his way fully their fate would be terrible.

The retention of a 5-cent fare remains the alpha and the omega of New York's transit policy, according to his report. Everything else seems to be secondary;

financial stability, efficient operation, increased convenience. Comfort and even decency for passengers do not seem to get so much as a serious thought. An elaborate and complicated plan, with many financial and legal contingencies, is set up, and the report then proceeds with meticulous care to argue that the scheme proposed would make possible the retention of a 5-cent fare. That seems to be the extent of its accomplishment. The slightest consideration does not seem to be given to showing just when the people of that city may expect to be treated less like sardines and more like human beings when they endeavor to ride on its rapid transit system.

Savings Banks Want Public Control to Continue

LEGISLATION has been drawn for introduction in Massachusetts to extend the period of public control of the Eastern Massachusetts Street Railway. This is an act that appears to be well considered. It is favored more particularly by the representatives of the savings banks of that state, who point out that under public control an insolvent railway in the hands of a receiver for a long time and in bad operating condition has been rehabilitated. The savings banks have, of course, in mind the conservation of the more than \$5,000,000 of bonds of the system held as part of the assets of their 2,800,000 depositors.

The present special act went into effect in 1919. It pledged the credit of the Commonwealth for the payment of principal of not exceeding \$4,000,000 of the road's serial bonds. The proposed new act in no way asks financial aid or credit from the Commonwealth. This is, perhaps, the most important distinction between the existing act and the one which the Savings Banks Association has indorsed. Under the terms of the proposed new act the Eastern Massachusetts property would continue to be operated by a board of five trustees appointed by the governor. They would have the same power as at present to regulate fares and to determine the character and extent of service. One section provides that they shall fix such fares as in their judgment will produce income sufficient to meet all operating and fixed charges, preferred dividends and 6 per cent on the common stock. Another section gives the company the right to sell electricity for light or power to the extent that it shall not be required for the proper operation of the railway, but the department of public utilities must first determine that public necessity and convenience require such sale.

The fact that the savings banks have a self-interest in seeing the present arrangement renewed detracts not a whit from the excellent record made by the railway management. Among the most noteworthy of the commendable things done was the division of the property into operating units, each made to stand on its own basis on the general theory of paying in fares to the extent

that the service was used. This plan has worked well. So was the provision well made that the cities served might contract within limits definitely fixed to making up any deficit from operation. Fortunately rehabilitation has progressed without the need for assessing any of the cost on the municipalities, but the provision is a wise one. Despite the trials and tribulations with which it has been beset the company has maintained a constant level of net earnings in the face of steadily diminishing gross income during six years. In this achievement the one-man car played a large part. It has, indeed, been hard sledding, but the courage of the management never faltered. After its house had been placed in order the railway went in for an intensive merchandising plan. The officers resorted to every expedient, not indiscriminately but wisely and well. It is none too soon to bring the matter of the renewal of the present arrangement to public attention. The good work should be permitted to go on.

Success in Rapid Transit Involves Co-ordination

PERHAPS no better demonstration of the necessity for co-ordination of transportation facilities to obtain best results has ever been made than that given in the Beeler report on rapid transit for Cincinnati, abstracted in two articles appearing in last week's issue and in this one. Several years ago the city of Cincinnati appropriated a considerable sum for the construction of a rapid transit subway line. The line was built in the rough, but has not yet been carried to completion. Meanwhile conditions have changed so that the need for the line for its original purpose, of furnishing an entrance for a number of interurban lines to a downtown terminal, does not exist. The problem was to find a use for the investment already made, totaling some \$6,100,000, so that it would bring some return to the city instead of lying idle.

Many estimates were made by the engineers to determine the best course of procedure. Naturally the simplest and the cheapest plan would be to complete the subway and run it as a separate unit. Used in this way, it was estimated that it would carry only 6,060,000 revenue passengers the first year. But by co-ordinating all the local facilities, and using surface cars, interurbans and bus lines to feed into the rapid transit line, it will carry 37,400,000 passengers the first year. Moreover, it will be possible to reduce the surface transportation mileage where it would duplicate the rapid transit, and so make a saving so great that not only will the combined system pay operating expenses, but from the start there will be almost enough revenue to meet fixed charges on the \$10,600,000 additional investment needed to complete the system.

A word of caution is not amiss for those who, for various selfish reasons, desire to modify any plan proposed so as to gain preference for some particular locality. It is shown conclusively that the addition of only three stations to those recommended would destroy the usefulness of the rapid transit line in the outer sections, would involve a serious loss of patronage, and would result in a deficit instead of a profit.

Every city administration that is faced with a need for rapid transit will do well to ponder this report, for it contains the essentials of success or failure for such an enterprise, set forth in no uncertain terms.

Prospects for Federal Income Tax Reduction

CORPORATIONS, as a whole, have been very patient with the federal government for leaving them out when favors in the form of tax reductions were to be handed out. Indeed, they accepted increases with comparative complacency when others were enjoying reductions. And probably little would be done about it now even though the corporation rate was increased from 1. to 13½ per cent and is now more than 2½ times the maximum normal rate for individuals and partnerships. had not the Treasury piled up an unprecedented surplus of \$636,000,000.

Is there anything inherent in the corporation form of business ownership and operation that would justify such high taxation as compared to that of individuals and partnerships? Its main characteristic is that of limitation of liability, but the present rate of taxation imposes very high rate of premium for this kind of negative insurance. If this unusually high rate of tax is to be continued we may expect to find more and more corporate businesses changing to another and cheaper form, or where this cannot be done, we may expect profits to decrease and the salaries of those in control to increase. An investigation of the income tax returns of one of our Middle Western states disclosed an alarmingly large number of corporations which were prosperous but were paying no dividends. The paradox of a lower rate of tax bringing in greater returns may be seen if the federal government reduces its rates.

A great part of the Treasury surplus above mentioned has already been paid out in debt retirement, but a huge sum is still available for return to the taxpayers. Who turns it to benefit? Under the act of 1926 the number of persons paying income tax to the government was reduced by almost one-half. While 7,369,788 persons made returns in 1925, only 4,171,051 did so in 1926. There are many who feel that the individual exemptions are already low enough and that too many people escape federal taxation. At any rate, there is little argument for further favors to this group while the corporate tax remains so high. For the holders of the shares corporations represent an enormous group of people rich, middle class and poor—and either they must pay high rate of tax for the privilege of investing in the form of business enterprise or pass the tax along—if they can! It is not often they can pass it along and they usually have to pay it.

There are some who feel that the demands for fiscal relief and control will make tax reduction impossible just now. Secretary Hoover, who may be expected to have clear ideas on this subject, says that reasonable demands for such purposes should not interfere with substantial reduction of the income tax, and that appropriations will suffice. If a tax reduction is to be made at this time, corporations should certainly benefit by it. Reductions for them are long overdue. The sentiment in the ways and means committee and among members of both houses of Congress is more favorable to the cause than ever before. This splendid opportunity should be used so that the case may be kept prominent before them. Every corporation executive in every state should bring this matter to the attention of his representative in Congress and the Senate in the interests of his stockholders and in those of the buyers of his goods or services.

The Special Library a Valuable Adjunct

WITHIN the last few years a new form of activity has been added to the work of the utility corporation. It is that of maintaining a special library for the purpose of keeping on file within ready reach all information available about the subjects in which the various departments are interested. In this way it differs radically from the general library, which is content with the usual catalog, but largely leaves to the reader the work of locating and classifying articles on a particular subject.

Several electric railways have for a number of years devoted considerable effort to the development of libraries of this type. The work they have done has been noteworthy. For this reason the article on the conduct of the library of the Philadelphia Rapid Transit Company, published in this issue, is of particular value. While this library is organized along the same lines as others which were established earlier, in a relatively short time an invaluable set of references have been built up. Then, through a co-operative association the information that has been collected by the several libraries of this class is made available to all, and a vast fund of information has been assembled on practically any subject in the field of the industry.

Wood Preservation Progressing

INTEREST statistics show that there are in the United States approximately 400,000 miles of steam railroads and about 47,000 miles of electric railways. The total number of ties in steam railroad tracks is approximately 1,100,000,000, of which about 730,000,000 or 66 per cent are treated. At the present time the steam roads are installing about 100,000,000 ties annually, of which approximately 65,000,000 are treated.

There are in electric railway tracks about 124,000,000 ties. According to the records of the United States Department of Commerce and the Department of Agriculture, the electric railways purchased approximately 5,000,000 untreated and 1,120,000 treated ties in 1925. No records are available to show the number of untreated ties which were subsequently given some form of treatment by the purchaser, but it is quite probable that it would not materially affect the comparison.

From the above, it is evident that while the steam railroads are replacing slightly less than 10 per cent of the total number of their ties per year, 65 per cent of the new ties have been treated. On the other hand, the electric railways are apparently replacing slightly less than 5 per cent of their total ties per year and treat less than 20 per cent of their new ties. The difference in the proportion of renewals is, of course, partly because the electric railways do not have the same proportion of renewals on account of mechanical wear as do the steam roads, and partly because of the more extensive use by the former of substitutes. No data as to the extent of the use of the latter are available, but they would undoubtedly show up favorably to the electric railways. The situation, however, is one which from the electric railway standpoint leaves considerable room for improvement.

At least two electric railway properties, Boston and Atlanta, own and operate their own treating plants and treat all ties and most of their other timber. One of these companies reports a cost of only 8.7 cents per treated tie per year as compared with 13.3 cents per

untreated tie per annum. Pressure treated creosoted ties have been known to give 30 years life in paved electric railway tracks. An extensive test installation on one steam railroad showed over 80 per cent of creosoted tie installations still sound after 17 years of service, and of the remaining 20 per cent more than half were removed for reasons other than decay. In this test it was proved that the average life of untreated ties ranged from 3.1 years for cottonwood to 8.5 years for white oak. The creosote treatment was full cell 10-12 lb. per cubic foot. In European tracks, life of treated ties as high as 40 years has been reported.

Big Returns from a Small Investment

PRESERVATIVE treatment is not limited to ties. The advantage for other timber is well known. Data recently published on a yellow pine pole line on the Bell telephone system between Hurricane, Ala., and New Orleans, La., which was installed in 1899, showed that in 1925 only 13.5 per cent out of a total of 7,644 treated poles in the line had been replaced because of decay. According to these data, the Bell system is now using between 600,000 and 700,000 poles annually, of which 90 per cent are treated. Government statistics show that the total number of poles being used per year is about 3,250,000. It is estimated that the telephone, telegraph, railroad and power companies are now treating about 2,500,000 poles annually, or 80 per cent of the total requirements. This is 6½ times the number treated in 1909.

About 10,000,000 cross arms are now being used per year, of which about 1,000,000 are treated. While this is only 10 per cent of the total, it represents an increase of 1,500 per cent over the number treated in 1909.

While reasonably accurate data are not available for posts, car timbers and mines, it is reasonable to assume that there is at least an equal opportunity for improvement in these fields. The records show that there are now being treated approximately 400,000,000 ft. b.m. of construction timber and miscellaneous material per year, but this represents only about 1 per cent of the total annual production of such timber, and while it represents a gain of 38 per cent over the amount treated in 1909, there is still much left to be desired.

The economies to be effected from preservative treatment of timber are so obvious as hardly to require argument. It is not a matter of first cost, but rather one of average annual cost during the useful life of the material. The experimental stage has been passed, the anticipated life of treated timber upon which installations were originally justified has been exceeded, and the element of uncertainty has been removed. There would appear to be no good reason for hesitation in the matter of choosing between treated and untreated timber. Every dollar spent on treated timber is the same as putting money away in the bank, where it will earn a substantial return to the investor.

The wood preservation committee of the American Electric Railway Engineering Association has been doing excellent work for several years along the lines of educating the electric railway industry as to the benefits to be derived from wood preservation, but "reading the directions on the bottle will never cure the ill." The directions must be followed and the dose taken as prescribed.



Part of the P.R.T. library staff, which furnishes technical information for the 12,000 employees

12,000 Employees Can Use This Library

P.R.T. librarians are called upon by all departments for information on transportation, economics and related subjects—The 6,000 books and 150 periodicals kept on hand are of vital importance in employee training—Library exhibit to be seen at A.E.R.A. Cleveland convention

IT MAY readily be understood that the important function of a special business library is to correlate and provide information on subjects of pertinent interest to the organization which it serves. Such a library must be more than an imposing row of well-filled bookcases, more than an amply filled periodical rack, more, even, than an efficient filing and clipping bureau. The company library must serve as an effective digestive apparatus, consuming vast quantities of printed words and skimming from that material the trace of nutritive information for which the company's executives and the rank and file of its employees may be seeking.

What the public library, serving persons of every type and interest, cannot do, the special library is created for the explicit purpose of doing. Its chief librarian and assistants are specialists in securing from material already on hand, or from outside sources, the information requested, almost always in a rush, by the personnel of the company and, so far as possible, in anticipating and meeting those requests in advance.

In so far as the company's librarians are able to shoulder a portion of the load of the executives and to

carry on at least the preliminary steps of a research along lines desired by the various departments, the special library proves itself as one of the most important functions of the company. Hardly less important is the operative part which it may play with the employee training activities, now being carried on by so many of the larger and even the smaller companies in every type of industry.

The Philadelphia Rapid Transit Company perhaps has more diversified fields of activity than any other urban transportation system at the present time. Not only does it embrace every type of public transportation in Philadelphia, high-speed lines, street cars, city and intercity bus service and taxicabs, but its employees and management also embarked some time ago upon the high seas of finance, with the establishment of the Mitten Bank under Mitten auspices.

In a rapidly expanding organization such as this there are, of course, constant calls for specific information on innumerable subjects. The executives and the employees wish to be kept constantly in touch with new developments in the street railway, motor bus and taxicab industries.

and such related subjects as co-ordinated transportation, accounting practice, customer and public ownership, employee and public relations, benefited property assessments, cost of living, accident prevention, traffic problems, indeterminate permits, employee representation in management, foreman training, fares, wages, investment practice and countless other matters.

One of the features of the P.R.T. library is to bring these subjects to the attention of the persons directly interested in the various problems—in abstracted form when possible and always so as to reduce the amount of unproductive “digging” which must be done by the individual seeking information.

The library was first established as a central bureau in 1919. Its beginnings were small. One bookcase and a limited number of trade periodicals were the seed from which have sprung the more than 6,000 volumes and the 150 periodicals which are now at the beck and call of every member of the P.R.T. organization. On Sept. 15, 1926, the resources of the library

are located in the carhouses, garages, shops, general offices and other departmental locations. Some form of library publicity is posted at all times, including lists of new books received during the month, with very brief reviews of each; lists of short abstracts of magazine articles, etc. All of these library bulletins are, of course, sent to the various officials.

All of the 150 periodicals subscribed for are carefully reviewed and articles of particular interest are abstracted. These short abstracts are typed on a routing sheet and pasted on the outside of the magazine in which they appear. The magazine is then routed to a regular list of readers and to such individuals as may be interested in special features which appear therein. Pads of bor-

Belgium —Electrification proposals (McCallum). 474	Vol. 54 July to Dec. 1919
Belgium —Governmental plans for electrification, 998 —Planned tramways, 746	Vol. 53 Jan. to June 1919
Belgium —Electrification plans 174	VOL-56, July to Dec - 1920
Belgium —Electrification projects 33 —Rehabilitating railways, 1184	VOL 57 Jan to June 1921
Belgium —Brussels side conduit in (Kappesvel) *948	VOL-60

ELECTRIC RAILWAY JOURNAL VOL. 65 JAN-JUNE 1925
Belgium —Brussels International Chamber of Commerce, Automobile discussion, 514.

we thrown open to all of the 1,000 employees of the company, this being in line with the policy of the management to provide every possible assistance to the men in their efforts toward self-advancement.

Circulation of books and of periodicals is only one of the functions performed by the library staff. A clipping department is maintained which combs the newspapers of Philadelphia and of cities in many other sections of the country, searching out relevant news notes which are pasted into daily clipping books and circulated among the company's officials. To increase the effectiveness of this work a number of outside clipping services are also utilized.

Since the central filing department is a natural corollary of the library, it too comes under the jurisdiction of the librarian. This work includes the classification and filing of all company mail, interoffice communication reports and other material which must always be at hand for ready reference.

BOOK REVIEWS AND LIBRARY BULLETINS
So that the employees may constantly know what new material the library has available for them, considerable use is made of the 100 company bulletin boards, which

Current collection —Energy consumption devices (Ewing). 643	Volume 55 January to June, 1920
Current collection —Losses at trolley contact (Ewing). *863 —Third rail shoe of Wilkes-Barre & Hazleton Ry. *424 —Trolley wheels. Device for truing (McMahon). *374	VOL-56, July to Dec - 1920
Current collection: —Third rail —Guiding device for (Burscham) *530. —Trackless trolley system. *1138	VOL 57 Jan to June 1921
Current collection: —Conduit construction in Washington (Dunn) *449 —Maintenance of devices (Delft) 803. —Pantograph shoe lubrication *223 —Steel and contact rail construction *441 —Third rail and overhead compound (Gibbel) 147 —Traveling trolley for cars inside shops 476 —Trolley shoe at slow speeds (Greer) 691 —Wailous) *581	VOL 59 Jan to June 1922
Current collection (continued) —Trolley shoe vs. trolley wheel (Savage). 187. —Savage). 187. (Ewing) 188. (DeBorne). 189 —Discussion by C. E. R. A. 181. —C. E. R. A. Eng. Council. 693 —Trolley wheel with stationary guides. *478	

ELECTRIC RAILWAY JOURNAL VOL. 63 JAN-JUNE 1924	ELECTRIC RAILWAY JOURNAL VOL. 65 JAN-JUNE 1925
Current collection (see also Overhead contact system) —Conductor rail maintenance in New York City *150 —Conductor rail. Under contract in London. 1878	Current collection (see also Overhead contact system) —Device for current-collecting (Delft and Tongue). 778
Current Collection (Continued): —Conduit construction New York City. *848. —Different voltages over one track. *643. —Steel wire troubles overcome in Port of War, Va. (Robinson). *787 —Third rail construction on Staten Island. *710.	ELECTRIC RAILWAY JOURNAL VOL. 66 JUL-DEC. 1925
ELECTRIC RAILWAY JOURNAL VOL. 64 JULY-DEC. 1924	Vol. 67. Jan. June 1926
Current collection (see also overhead contact system) —Conduit construction. Chicago. *63.	Current collection —Maintenance of equipment reduced. Ft. Worth. T. S. *1049

Information on certain subjects is prepared and sent to a list of officials on Lefax cards

made to the employees for any of the library service, but they, of course, are held responsible for books and periodicals loaned and are expected to return them within a reasonable period.

To determine how extensively the employees are making use of the library and also to ascertain the type of material which is most in demand careful records have been kept of all publications loaned and the locations to which they are sent. It was found, as might be expected, that shop employees were particularly interested in mechanical works and in maintenance articles published in ELECTRIC RAILWAY JOURNAL and elsewhere, while trainmen centered their attention on subjects lying more nearly in their field of activity, such as traffic studies, co-ordinated transportation, etc. All employees, however, have in common a very real interest in personal

rower's application blanks are kept near each of the bulletin boards and when an employee wishes a certain book or periodical he simply fills out the card with the necessary information and the desired publication will be sent to him as soon as it is available. The company inter-office mail is utilized for this service. No charge is

NEW YORK STATE RAILWAYS CO
SYRACUSE, N. Y.
Rates of Fare

Effective Date	Cash	Trans-
10-1-22	7c	

PUBLIC SERVICE RAILWAY CO
Newark, N. J.
Rates of Fare

Effective Date	Cash	Tickets	Transfers
10-1-23	5c		
	zones		

Some of the index cards which make easy the finding of information on special subjects of interest to the library's users

analysis, investment practice, public and employee relations and similar more general subjects. "How to Get Ahead Financially," by William A. Schnedler, and "Financial Independence, How to Win It," by Harvey A. Blodgett, are two of the most popular volumes on the library shelves.

WORKING WITH THE TRAINING AND EDUCATIONAL DIVISION

The company is constantly expanding its educational work among the employees and the facilities of the library are thus being subjected to a corresponding increase in demand. Three correspondence courses, "The Electric Railway Industry," "Handling Men" and "Public Relations," are now being offered to the men and evening classes in public speaking, mathematics, English, blueprint reading and similar subjects will be offered during the fall and winter months. With all of these the library must co-operate by preparing reading lists and suggesting texts which will provide valuable supplement-

tary information for those participating in the courses.

Extra copies of books and magazines which are subjected to the greatest demand are purchased, so that long delays in getting a desired publication may be avoided. An attempt is made to obtain copies of all surveys made in Philadelphia and in other cities on problems which affect coordinated transportation. When a particularly illuminating survey is made extra copies are secured and distributed to employees who request them.

The annual reports of the company are exchanged with about 100 other transportation companies and this collection of reports is of great assistance in the compilation of comparative statistics. The company publications, *Service Talks* and *P.R.T. Co-operator*, are also exchanged with a large number of other companies and publications received in return are routed to interested officials and are then filed.

A fare and wage history of street railway and motor bus companies of comparable size has been compiled. A book of fares and wages in effect is made up on 3½x6½-in. Lefax sheets. Copies of this book are in the hands of the various department heads. As fare and wage changes occur revised sheets are distributed.

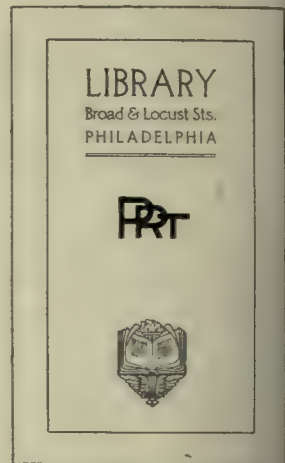
Bound volumes of *ELECTRIC RAILWAY JOURNAL* and its predecessors from 1894 to date are maintained by the library. A cumulative index for this publication, from 1916 to date, is prepared to facilitate ready reference. This indexing has been accomplished by clipping and pasting all index references to articles on one subject on one or more cards. The volume number appears above the clipping, as is shown in an accompanying illustration.

Service Talks and *P.R.T. Co-operator* are bound with a carefully prepared index. A frequent query with the library is "Where did we publish this?" and it is thus essential that all company publications be thoroughly indexed.

The A.E.R.A. compilations, which are found to be of great assistance and value, are filed in vertical steel cabinets using the same subject headings which the association publishes in its annual report.

A large collection of legal books is maintained for the benefit of the company's legal staff. This collection includes the various Reporters, Pennsylvania Superior and Supreme Court Reports, U. S. Superior Court Reports, the American Law Reports, U. S. Supreme Court Reports and Pennsylvania Court Reports. An index to all legal opinions emanating from the company's legal staff is prepared.

Other sources of information which are filed over a period of years are: Decisions and reports of the New York Public Service Commission, the New York Transit Commission, Pennsylvania Public Service Commission decisions, Philadelphia ordinances, Mayor's message-city transit department reports (Board of Supervising Engineers of Chicago Traction report), the *Commercial*



The bookplate by which the volumes owned by the P.R.T. library are identified

ROUTING SHEET
ARTICLES OF SPECIAL INTEREST IN
ELECTRIC RAILWAY JOURNAL

Date May 14, 1927

SUBJECT	Page
BOSTON ELEVATED RAILWAY	
Legislation for Boston "L" fails - valuation ordered.	879
BROOKLYN CITY RAILROAD	
Dividend policy explained. Circumstances connected with passing of Brooklyn City dividend reviewed - \$11 000 000 for improvements.	882
BROOKLYN - MANHATTAN TRANSIT CORPORATION	
Approval of \$20 000 000 Brooklyn refunding issue sought.	882
BUFFALO MOTOR BUSES	
Duplication not the answer in Buffalo. Application has been denied the Buffalo Motor Coach Co. to operate	

Mitten Bank has merged with Brotherhood of Locomotive Engineers Title and Trust Co. 878

MONORAIL

Monorail proposal for Detroit under advisement. 879

Your attention is called to special articles contained herein. When you finish reading, kindly initial and date, and forward to next succeeding name. If you do not contemplate prompt use of magazine please forward, and after routing has been completed it can be secured from library or photostatic copies of desired articles obtained.

Librarian, 1520 Spruce Street.

Messrs: W. K. Myers ✓
C. E. Ebert ✓
W. M. Campbell ✓
H. B. Hutchinson JUN 3 1927
W. W. Logan ✓

Items of special interest in the leading periodicals are listed by the librarian on the routing sheet which is sent with the magazine

There are more than 6,000 volumes in this library of the Philadelphia Rapid Transit Company

Here are the "Best Sellers" as indicated by the reading of P.R.T. employees during a recent four-month period.

MOTOR VEHICLES AND THEIR ENGINES, by Edward Smith Fraser and Ralph B. Jones

HOW TO GET AHEAD FINANCIALLY, by William A. Schnedler

FINANCIAL INDEPENDENCE—HOW TO WIN IT, by Harvey A. Blodgett

INCREASING PERSONAL EFFICIENCY, by Donald A. Laird

MAKING OF PERSONALITY, by Bliss Carman

ELECTRICAL RAILWAY PRACTICES (edited) by Henry H. Norris

HANDBOOK OF SAFETY AND ACCIDENT PREVENTION, by Fred W. Lange

PRACTICAL FOREMANSHIP, by Glenn Gardiner

FOREMAN TRAINING, by Cyrus McCormick

TECHNIQUE OF EXECUTIVE CONTROL, by Irwin H. Schell

HOW TO MAKE AND USE GRAPHIC CHARTS, by Allan C. Haskell

ELECTRIC RAILWAY TRANSPORTATION, by Henry W. Blake and Walter Jackson

THE WAY OUT, by Edward A. Filene

MAKING TRANSPORTATION PAY, (edited) by Henry H. Norris

PRACTICAL RAILWAY MAINTENANCE, by Charles W. Weiss

ELECTRIC POWER STATIONS, by L. W. W. Morrow

Philadelphia Rapid Transit Company, and Lewis A. Armistead, librarian of the Boston Elevated Railway.

Copies of a specially prepared booklet entitled "The Value of a Company Library" have been prepared by this committee and have been sent to various transportation companies. Copies will be available at the Cleveland convention or may be obtained from any of the committee members.

The purpose of the library exhibit will be to point out the type of service which a company library should be equipped to render and to demonstrate the relative ease with which such a department may be established and built up to be one of the most useful adjuncts of the organization. The point will be made that a small company has quite as much need for a library of its own as have the larger organizations, although, of course, it will not need to be as extensive as those of the metropolitan companies.

Bus Speed on Fifth Avenue

IN THE caption of the illustration appearing on page 1486 of ELECTRIC RAILWAY JOURNAL for Sept. 17, it was stated that the speed of buses in the congested section of Fifth Avenue, New York City, in the rush hour was "about 5 m.p.h." The figure should have been "3 m.p.h."

Car Building and Shop Statistics

STATISTICS of the car manufacturing industry as issued by the United States Census Department over two years. Included in them are statistics of electric cars built and electric railway repair shops.

Table I shows the electric railway cars built in 1925 according to figures in the latest census. The data are divided into freight and passenger cars. The table includes not only those manufactured in car building plants but also in railway shops. The value of the 1,79 passenger cars built is given in the report as \$19,604,811, and that of the 89 freight and other cars built as \$453,479.

Table II gives statistics of the electric railway repair shops in the country for the three years mentioned in the table. These figures, however, do not include data for establishments with products under \$5,000 in value. The average number of wage earners during 1925 employed in the shops included in the table was 32,521; during 1923, 34,925, and during 1921, 33,279. The wages paid in these shops during 1925 were \$48,357,386.

Table III gives detailed statistics of the work performed in the shops listed in Table II.

TABLE I—ELECTRIC RAILWAY CARS BY CLASSES AND TYPES OF CONSTRUCTION, BUILT IN THE UNITED STATES IN 1925

	Passenger	Freight and Other	Total
All wood.....	11	5	1
Steel under-frame.....	424	43	46
Steel body with wood interior.....	955		95
All steel.....	408	41	44
Total.....	1,798	89	1,88

TABLE II—OUTPUT OF ELECTRIC RAILWAY REPAIR SHOPS IN THE UNITED STATES, 1925, 1923 AND 1921

	1925	1923	1921
Number of establishments.....	521	547	56
Wage earners (average number).....	32,521	34,925	33,27
Wages paid.....	\$48,357,386	\$49,225,583	\$47,775,23
Paid for contract work.....	\$121,883	\$110,949	\$105,86
Cost of materials*.....	\$29,738,148	\$31,981,650	\$33,560,13
Value of products.....	\$83,812,220	\$86,412,645	\$87,312,42
Value added by manufacture†.....	\$54,074,072	\$54,430,995	\$53,752,29
Horsepower.....	70,479	62,370	8

*Includes also cost of fuel, electric power and shop supplies.

†Value of products less cost of material.

‡Not called for in schedule.

TABLE III—DETAILED STATISTICS OF WORK PERFORMED IN ELECTRIC RAILWAY REPAIR SHOPS IN THE UNITED STATES, 1925, 1923 AND 1921

	1925	1923	1925
Total value of work or products.....	\$83,812,220	\$86,412,645	\$87,312,426
Motive power and machinery departments, value.....	\$6,210,757	\$7,303,978	\$7,715,044
Electric locomotives built—			
Number.....	14	17	0
Value.....	\$216,078	\$198,775	
Repairs to motors, etc., value.....	\$5,525,622	\$6,692,410	\$7,226,905
Work for other corporations, value.....	\$117,000	\$101,754	\$78,472
All other work or products, value.....	\$352,057	\$311,039	\$409,667
Car departments, value.....	\$73,177,906	\$75,070,768	\$75,529,519
Cars built, value.....	\$608,988	\$3,523,648	\$1,248,267
Passenger—			
Number.....	45	299	127
Value.....	\$574,664	\$3,287,447	\$822,398
Freight—			
Number.....	1	47	2
Value.....	\$9,633	\$103,738	\$7,200
Other—			
Number.....	0	37	48
Value.....	\$24,691	\$132,463	\$418,667
Repairs to cars of all kinds, value.....	\$65,392,764	\$65,420,854	\$69,131,546
Work for other corporations, value.....	\$1,216,247	\$1,486,380	\$1,249,497
All other work or products, value.....	\$5,959,907	\$4,639,886	\$3,900,209
Bridge and building departments (shop-work only), value.....	\$639,619	\$438,624	\$516,942
Repairs and renewals, value.....	\$608,317	\$434,590	\$420,442
All other work or products, value.....	\$31,302	\$4,034	\$96,497
All other work or products, not classified, value.....	\$3,783,938	\$3,599,275	\$3,550,921

*None reported.



Hamburg has an excellent elevated and subway system with suburban extensions. This is a standard six-car train

Rapid Transit Car Design and Noise Reduction in Europe

By Henry W. Blake
Senior Editor *Electric Railway Journal*

European rapid transit cars are developing long American lines. Considerable progress has been made in London in the direction of reducing the noise from car operation. European surface cars are noticeably more quiet in movement than those in the United States

CARS on the rapid transit lines in Paris, Berlin, Hamburg and London bear a closer resemblance to those used in America than do the street cars. The bodies generally are of steel throughout, with multiple side doors, and the arrangement of seats gives large standing capacity. Sometimes these seats are entirely longitudinal, sometimes there are two or more pairs of cross seats on each side of the aisle.

All of the lines mentioned use sliding doors that are closed while the train is in motion, but otherwise the door arrangements differ greatly. The latest cars in London, those for the Hampstead Tube, have an arrangement similar to the Interborough system of door control. The Hampstead Tube is running two trains, one of six cars and one of seven cars, with only one guard per train and electric-pneumatic door control with bell signal interlocking with the doors. The guard is near the rear end of the train and can communicate with the motorman by a telephone with a loud speaker in the latter's cab. This will introduce automatic doors as rapidly as possible

because of the saving in labor, and it is expected that they will be on all tube cars within three years.

On the rapid transit lines in Paris, Berlin and Hamburg the general practice is for the passengers to open the doors at stations, but for a member of the train crew to close them, usually by electrically controlled air engines. The Berlin elevated and underground railway, however, is putting on three sample trains, each with multiple-unit door control of different types. One will be of the Paris type, one a modified National Pneumatic type, and one the Kunz-Knorr type. In the National Pneumatic type one door engine operates both halves of each door, the power being transmitted to each half independently so that the work is equally distributed on both sides of the engine crosshead. If the door is obstructed while being closed the engine automatically adjusts its pressures so that the door will not slam when the obstruction is removed. The engine also has an automatic cushioning feature which eliminates the possibility of the door slamming at any time. Although

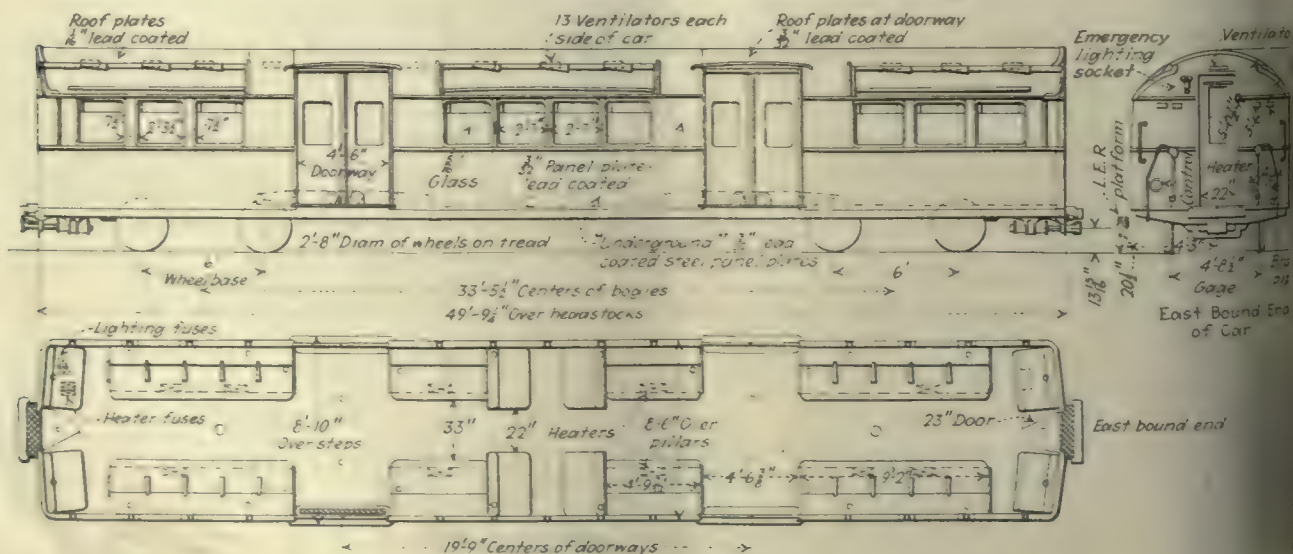


A "skirt" of ferrodo was built around the trucks of the London tube cars to confine the noise

Table Showing Weight of Cars on London Tube Railways in Tons of 2,240 Lb. Each

Type of Car	Weight of Car, Tons (2,240 Lb.)								
	Total	Car Body	Motor End	Trailing End	Control End	Motor Truck	Motor Trailer Truck	Trailer Truck	Seating Capacity
Piccadilly standard (motor car).....	27.62	14.03	19.45	8.17	.....	10.52	3.06	.....	42
Piccadilly converted (motor car).....	29.59	16.00	19.67	9.91	.....	10.52	3.06	.....	32
Bakerloo standard (motor car).....	28.91	15.32	19.16	9.74	.....	10.52	3.06	.....	42
Bakerloo Brush (motor car).....	29.82	16.15	19.43	10.40	.....	10.52	3.15	.....	36
Bakerloo converted (motor car) (a).....	27.60	14.01	19.25	8.35	.....	10.52	3.06	.....	34
Bakerloo joint stock (motor car).....	32.49	17.43	21.95	10.54	.....	11.86	3.20	.....	36
Hampstead standard (motor car).....	27.53	13.94	19.39	8.13	.....	10.52	3.06	.....	42
Hampstead Metro (1923) (motor car).....	31.52	15.80	22.23	9.29	.....	12.29	3.43	.....	36
Hampstead Cammell (1923) (motor car).....	31.99	16.29	22.31	9.67	.....	12.21	3.48	.....	30
Hampstead Metro (1924) (motor car).....	32.65	16.96	23.10	9.55	.....	12.21	3.48	.....	30
Hampstead Cammell (1925) (motor car).....	33.11	17.42	23.04	10.07	.....	12.21	3.48	.....	30
Piccadilly standard (trail car).....	16.89	10.86	.....	.....	.....	.....	.....	3.01	52
Piccadilly Cammell (1919) (trail car).....	18.25	12.52	.....	.....	.....	.....	.....	2.86	44
Bakerloo standard (trail car).....	18.14	12.11	.....	.....	.....	.....	.....	3.01	52
Bakerloo joint stock (trail car).....	21.20	14.80	.....	.....	.....	.....	.....	3.20	48
Hampstead standard (trail car).....	16.63	10.61	.....	.....	.....	.....	.....	3.01	52
Hampstead Cammell (1923) (trail car).....	18.45	11.69	.....	.....	.....	.....	.....	3.38	48
Hampstead B'ham (1923) (trail car).....	17.75	11.15	.....	.....	.....	.....	.....	3.30	48
Hampstead B'ham (1924) (trail car).....	18.25	11.65	.....	.....	.....	.....	.....	3.30	48
Hampstead Metro (1925) (trail car).....	.....	.....	.....	.....	.....	.....	.....	.....	48
Piccadilly standard (control trailer).....	17.35	11.32	.....	8.44	11.91	.....	3.01	3.01	52
Piccadilly Cammell (1920) (control trailer).....	18.75	13.02	.....	9.14	11.61	.....	2.86	2.86	44
Bakerloo standard (control trailer).....	18.60	12.57	.....	9.07	9.53	.....	3.01	3.01	52
Bakerloo joint stock (control trailer).....	21.85	15.45	.....	10.54	11.31	.....	3.20	3.20	48
Hampstead standard (control trailer).....	17.10	11.08	.....	8.32	11.78	.....	3.01	3.01	52
Hampstead Metro (1923) (control trailer).....	18.92	12.21	.....	9.14	9.79	.....	3.38	3.34	44
Hampstead Cammell (1924) (control trailer).....	19.54	12.74	.....	9.21	10.32	.....	3.42	3.38	44
Hampstead Metro (1925) (control trailer).....	19.76	13.05	.....	9.38	10.38	.....	3.38	3.34	44

(a) Trail car converted to motor car.



The latest type of tube car has its main sash fixed to keep out noise and has an inswinging upper sash. The drawing shown is of a trail car

passengers are provided with handles inside and outside for opening the doors, they can do so only when the train guard has set his control switch to the door-unlocked position. This he does in normal operation only when the train has entered a station. Once the doors are open they remain so until closed by the guard.

The operation of these inside and outside door handles are independent of each other because passengers at a crowded station were accustomed to hold the doors closed to prevent passengers on the platform from entering the car. While the handles are at the usual height, the latch is at the top of the door and is connected to the handles by levers. The purpose of this arrangement is to remove from the side of the door any sharp projection which might tear the clothing of passengers during entrance or exit.

In the Paris type, the doors are opened by the passengers but are closed by the motorman after a train leaves the station, through electrically controlled air cylinders. The doors are equipped with an ordinary latch, and when they come together with considerable force, under the action of this air cylinder, the latch drops into place through impact. On some of the new cars the doors are interlocked with the control so that the train will not start until all the doors are closed. On the older cars there is no interlock and passengers can open the doors from the inside or outside without any warning to the motorman.

TWO-FARE CARS IN LONDON AND PARIS

The tube or deep underground railways in London operate only one class of car, but on the shallow London underground lines, the Metropolitan and Metropolitan District, there are two classes. They are marked respectively first and third. The retention of these names is in line with the practice on most of the steam railroads in England, which originally operated three classes of cars, first, second and third, with different rates of fare. The second class was abolished on most of the steam railroads years ago, and the Metropolitan and Metro-



The Paris subway cars have three side doors and passengers are expected to enter by the center door. This is a first-class trailer. The class is indicated by the color (red) and also the numeral "1" on the side

politan District Railways, being old steam roads, have adhered to the "first" and "third" arrangement. The seats in the first-class cars are upholstered somewhat more luxuriously than those in the third class, and the outside is painted a different color so that the first-class cars can be recognized readily as they enter a station. On a six-car train on these two London lines the standard arrangement is to run two first-class and four third-class cars, the first-class cars being the second and fifth in the train, counting from either end. In a seven-car train there are three first-class cars, and they are placed in the second, fourth and sixth positions, counting from either end. The policy of the London company is to use moquette upholstery for all cars.

In Paris two classes of cars, first and second, are operated in all trains. They are of different exterior coloring so passengers can readily distinguish them when they arrive at a station and they are always in the same positions in the trains. The number of passengers paying first-class fares in Paris last year were 11.19 per cent of the total, though they contributed 16.29 per cent of the receipts. The standard trail car on the Paris Metropolitan line weighs 43,120 lb. and has a rated carrying capacity of 38 seated and 69 standing when used as first class and 38 seated and 72 standing when used as second class. An interior view of one of these cars is published. The motor car has slightly fewer seats because of the space occupied by the motorman's compartment. The



European rapid transit cars provide plenty of standing space. At left, Paris Metropolitan car; at right, latest type of London tube car



The London tubes are tubes in fact as well as in name. Larger diameters are used at junction and stations

proportion of higher-fare cars in a Paris train is always less than 50 and may be only 25.

In Hamburg and Berlin the rapid transit lines have only one class of fare. In Berlin it was the practice until recently to operate two classes of cars, but now those which formerly were the higher fare cars are used for smoking while the former lower fare cars are for non-smokers. Interior fittings are alike and all seats are being upholstered in imitation leather. Further particulars of these cars were given in last week's issue.

NOISE REDUCTION EXPERIMENTS IN LONDON

Of all the rapid transit lines abroad a greater study of the causes of noise reduction has been made by the London Underground Electric Railways than by any other. These studies were begun five or six years ago. Special attention was given to the conditions on the company's tube railways as, owing to their constricted section, only slightly larger than the car, it was thought the noise in them was somewhat greater than in the larger tunnels of the company, like the Metropolitan District Railway. The results of these early tests were published in this paper during 1924, particularly in the issues of Jan. 26, March 29 and Sept. 20.

Since the conclusions then reached were made public the company has had an experience of more than three years with various remedial measures. As some of the arrangements have been materially altered a review of the situation will be given, together with some particulars of the latest type of tube car, and comments on the relative amount of noise in operation of European surface cars as compared with those in the United States.

It is believed by the management of the London Underground Electric Railways that the principal noise produced by its trains comes from the motors, gears and wheels. The company's first efforts were to reduce the volume of noise. Later efforts, which have been directed to keeping the noise out of the cars, may be divided into two parts, namely (1) to retain the noise in the place where it is generated and (2) to keep it from entering the car.

To gain the first mentioned object, i.e., to retain the noise at the point where it is generated, a sort of skirt

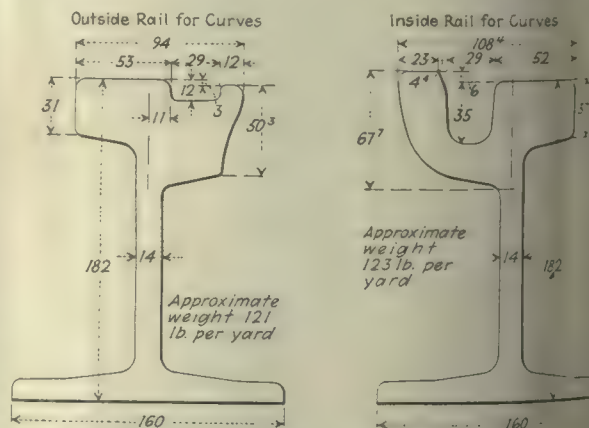
was built around the truck. This skirt consisted of a screen made of ferrodo or composition board, carried near the live rail as possible. While this gave fair results, it was looked upon as being somewhat of a risk. It was also inconvenient when an examination had to be made of the equipment. Moreover, it was found that much of the noise from beneath the car could be eliminated by better truck design. Hence, special attention has been given in the later types of trucks to that they have fewer parts and better springs. A decision in regard to springs was reached after a movie picture had been taken of a truck while it was running at high speed. This picture showed that the truck jumped by leaps and bounds. The more resilient springs in the present trucks are designed to reduce the length of these leaps and the reduction in parts to reduce the number of them which would rattle. It was found even in the open a truck would be noisy if the springs were stiff.

A great deal of noise in trucks was found to come from the gears, and some from the motor brushes. The remedy here, in the opinion of the engineers of the company, is better design and maintenance, particularly better maintenance.

The efforts made to reduce noise in car bodies were similar to those made with trucks, namely (1) to reduce the noise, (2) to keep it where it was generated and to prevent it from entering the inside of the car.

In damping the noises on the car frame use was made of air-cell or sheet asbestos. This was installed in a thickness of $\frac{3}{8}$ to $\frac{1}{2}$ in. between the inside and the outside car panels. Some of it was also put under the floor and some in the roof. In the form in which it was used, however, it was found to be hygroscopic, i.e., it absorbed moisture and tended to rust the metal parts against which it was placed.

An effort was then made to cover these parts, particularly the inside of the outer panel, with a film of lead to prevent rusting, but finally the use of sheet asbestos was abandoned for open mesh cotton scrim. It is believed that the use of this material, well cemented on the non-producing or reflecting parts like the sash, panels, floor and ceiling, will stop their tendency to drum. This material also helps to hold the paint. It is attached with marine glue. In the flooring the scrim is placed under the wooden flooring and the wood is treated for fire proofing. In the latest cars the ceilings are non-metallic so that it is not considered necessary to use this material there.



The Paris surface lines use a shallow groove for the outside of all curves up to 90-ft. radius. It reduces friction and noise from cars passing around curves

All cars built since 1923 up to last June, 444 in number have been constructed in this way. The same protective measures have also been adopted for 100 cars of the District Railway, owned by the same company. In the cars the scrim is attached to the side sheathing. The company has also tried strips of asbestos fabric boiled in oil, so as not to be frictional, and attached to the foundation and hand brake rigging and a few other places where there might be a chatter.

CUTTING OFF ENTRANCE OF NOISE INTO CAR

So much for noise reduction. The other recourse in the company's policy is to prevent the noise generated from getting into the car. If the passengers could be sealed within a car they would probably hear very little noise. This is impracticable. The next best plan is to reduce the amount of noise that gets in at the windows and elsewhere.

Originally the windows were arranged to drop, but it was found that passengers would keep them open unnecessarily. Now the sash is fixed, but above the main sash is a narrow sash, the width of the lower window, and hinged so as to swing inward. This sash is normally kept open and is found sufficient to give air as well as to keep out the rain when the car is outside the tunnel, but it is not large enough to admit as much noise as if the entire window was open. Another step to keep out the noise has been to make the window areas smaller and the glass in them thicker. A change was also made in the ventilators by arranging their passageways to be tortuous.

The company has constructed instruments for measuring noise, but while these instruments determine the volume of the noise produced, they cannot measure the irritating effect of the noise on the passengers, the degree of which, it is believed, depends not only on the volume, but to a considerable extent on the musical pitch of the noise. Thus, a note which compels persons to raise their voices while talking with others is tiresome, whereas a noise which does not require this would probably be less irksome to most persons. It has been found that in small tunnels there is more vibration and consequently more noise than in larger tunnels, like the District tunnel.

LITTLE NOISE FROM SURFACE CAR OPERATION

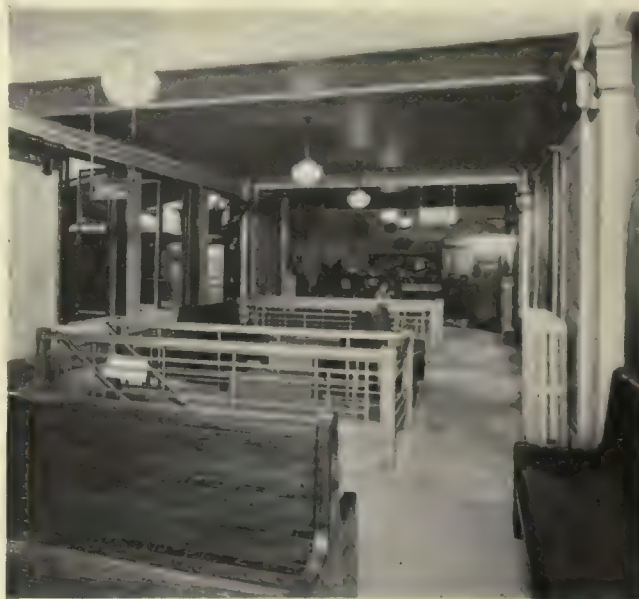
Outside of these experiments in London the European electric railways do not seem to have given any special attention to noise reduction. Nevertheless, the surface cars in Europe are noticeably less noisy in operation than those in the United States. This fact was noticed and commented on by the 1924 Committee on Foreign Operation of the American Electric Railway Association, whose report was published in the *ELECTRIC RAILWAY JOURNAL* for Sept. 20, 1924.

Among the reasons given by that committee for this condition are better maintenance of cars and track, slower speeds of cars, use of wood in car construction, extended employment of fixed window sash and lower weight of cars. To these might be added the more common use in Europe of manganese flange-bearing special work, and in some cities the use of manganese flange-bearing rails for outside of all curves up to 90 ft. This is the practice in Paris. Where such rails are not used a great deal of attention is usually given to greasing the sides of the rails in curves to prevent squealing and friction. This is the practice in Berlin.

Chicago's Wells Street Terminal Opened

WORK on the new \$250,000 Wells Street terminal of the Chicago Rapid Transit Company was completed in time so that the station was officially opened on Aug. 1. It is now serving the thousands of west side and west suburban residents who daily enter and leave the Chicago Loop at that point. The new structure also provides a modern and spacious Loop terminal for the Chicago, Aurora & Elgin Railroad, serving the Fox River valley and other points west of Chicago.

On the first floor of the terminal is the main lobby, containing the Chicago, Aurora & Elgin Railroad ticket offices and baggage checking room, twenty telephone booths, rest rooms, a restaurant and a soda fountain



Entrance to station platforms and trains is from the third floor waiting room in the new Wells Street terminal of the Chicago Rapid Transit Company

concession. The second and third floors are "L" shaped, being constructed around the Chicago Rapid Transit Lines elevated structure. The north wing of the second floor includes a trainmen's room, with connection to the platform. Half of the east wing provides offices for the Chicago, Aurora & Elgin Railroad, while the other half contains a women's rest room and men's smoking room. On the third floor, which is reached either by elevator or stairway from the first floor, is a large waiting room. This room, located at platform level, gives access to all trains. Direct connections with the Rapid Transit Lines are made at the Quincy and Wells station of the Loop, which is reached by a glass-inclosed bridge extending over the sidewalk.

Walls and columns of the new station are of pink Tennessee art marble, with bronze capitals and old ivory cornices and ceiling. The floors are of terrazzo. Ticket booths are finished in bronze. A feature of the station is a system of electric amplifiers through which trains are announced throughout all parts of the building. The front of the building is designed in terra cotta and the rear of the structure adjacent to the tracks and platforms is of old English mission brick. Architect A. U. Gerber designed the new terminal.



Cincinnati's business district as it is today

Co-ordination Essential for Rapid Transit in Cincinnati

ARTICLE II

LAST week's article on the report of the Beeler Organization on rapid transit facilities for Cincinnati showed that the unfinished line should be completed with minor modifications, but that it should be extended to Fountain Square on the downtown end and to Oakley on the outer end. Following this discussion the report continues to show how the traffic was estimated and the financial results calculated. The following article, largely an abstract of the report, completes the presentation of the plan recommended.

A number of interesting methods were used to determine the probable rapid transit traffic and the loading at the various stations. Based on the riding on the street railway and the local bus lines, 5,045,379 rides would be made annually directly on the rapid transit line,

This, the second and concluding article on the Beeler report to the city of Cincinnati, shows the traffic that can be developed by the rapid transit line with various plans for operation. Only if the line is co-ordinated with the existing transportation can a profit be obtained

18,868,442 with one transfer a 11,532,230 with two transfers making a total of 35,446,051 annual riders. The daily loading shown in the traffic charts.

Standard gage track, laid with 100-lb. rail on treated ties in ballast, was recommended, with third rail at 600 volts d.c. power supply. A complete signaling system was considered essential including interlocking switches and signal towers.

The car recommended is 49 ft. 11 in. long and 10 ft. wide. The locations of the doors are such as to facilitate rapid interchange of passengers. The car should weigh about 26 tons. It will seat 50 or 52 passengers and have a comfortable loading capacity of 162 and a maximum capacity of 200. Each car will be equipped with two 100-hp. motors. The manufacturers state that

Recommendations for Cincinnati Transit Summarized

1. Merge all street railway and bus lines with rapid transit system.
2. Extend existing subway to Fountain Square.
3. Extend outer end to Oakley.
4. Construct street car line between Madisonville, Mariemont and Oakley station.
4. Relocate Ludlow station in vicinity of Knowlton's Corner.
6. Construct and operate nine stations only on rapid transit line, as designated.
7. Provide prepayment areas for transfer between surface and rapid transit at five stations designated.
8. Adhere to recommendations in report as to schedules, running time and headways to secure fast, frequent and regular service.
9. Secure C., H. & D. Railway as tenant to serve College Hill territory.
10. Follow the changes recommended for street car and bus lines to co-ordinate with rapid transit and obtain minimum fare.

his motor capacity is capable of hauling a maximum load of 40 tons at a maximum speed of 45 m.p.h. with an accelerating rate of 1½ m.p.h.p.s. under the conditions pertaining to this line.

The choice of car for Cincinnati lies between the single car with automatic couplers and the two-car articulated unit, since the density of traffic does not justify employing units of more than two-car capacity. The advantage of the articulated unit is chiefly that a given carrying capacity can be secured at lower first cost and the cost of operation is about 9 per cent less than that of equal capacity provided by single units. Its disadvantage is that the articulated unit, having twice the capacity of a single car unit, cannot be adjusted to fit traffic demands so closely as the single car. Because of the greater flexibility and the comparatively low requirements it was recommended that single cars operated in trains be used. Though further developments and greater experience with the articulated unit between now and the time the cars will be needed in Cincinnati may justify its adoption at that time.

DETERMINING SERVICE CHARACTERISTICS

Considerable attention was given to determining probable schedules. Intermediate running times were calculated between stations, with sufficient allowance for stops and for coasting to insure efficient operation. For the entire distance of 11.86 miles between Fountain Square and Oakley the total time estimated is 28 minutes. This includes 20-second stops at all stations except Fountain Square, giving an average speed between terminals of 24 m.p.h. A 30-second stop is allowed at Fountain Square and a layover of 6½ minutes at Oakley to take care of any unforeseen delays, afford time for changing cars, etc. On this basis each train will complete a round trip in 63 minutes.

A three-minute headway was decided on as meeting the demands for frequency of service. This headway would be maintained all day, except between midnight and 1 a.m. and between 5 and 6 a.m. No service is provided between 1 a.m. and 5 a.m., although it might later be found desirable to keep one train operating on a 60-minute headway during the owl hours. Saturday service is assumed to be the same as that for other weekdays but it necessarily would have to be distributed somewhat differently.

The same number of trips will be operated on Sundays as on weekdays. It is assumed that single cars will be operated until noon and two-car trains for the remainder of the day. With the proposed schedule it was found that a total of 7,445,684 car-miles will be operated annually, of which 6.3 per cent will be operated with one car, 56.9 per cent with two-car trains, 13.2 per cent with three-car trains and 23.6 per cent with four-car



Eastern water level entrance to the Basin, the central district of Cincinnati

trains. The total car-hours corresponding to this would be 330,886 annually, allowing for pull-outs and pull-ins.

The number of train-hours shows that 390 hours 9 minutes would be operated on weekdays and 388 hours 9 minutes on Sundays and holidays, making a total of

TABLE I—SURFACE EQUIPMENT ON LINES AFFECTED BY RAPID TRANSIT PLAN

	Present	Proposed	Reduction
Street railway cars:			
A. M. rush period	290	260	30
Base	126	114	12
P. M. Rush period	312	280	32
Street railway buses:			
A. M. rush	49	38	
Base	28	26	
Base	51	38	
Independent buses:			
A. M. rush	84	0 (a)	95 (b)
Base	79	0 (a)	81 (b)
P. M. rush	84	0 (a)	97 (b)
Total cars and buses			
A. M. rush	423	298	125
Base	233	140	99
P. M. rush	447	318	129

(a) None shown because merged with unified system.
(b) Includes reduction in street railway buses.

142,286 train-hours annually. This figure represents the number of hours that a motorman and a conductor will actually be on duty on a train. Adding time for reporting and for pull-outs and pull-ins made by the regular



Time zones from Fountain Square using present street car lines



Old canal bed at Race Street bridge, before construction of rapid transit line began

crews brings this up to 148,686 hours. This is practically the pay hours for motormen and conductors required to operate the system because with no extra trainmen required for rush-hour trips, this service being cared for by operating more cars in a train without added men, there should be little time to be paid for which does not represent active duty.

The maximum car requirements occur in the evening rush hours, when 21 four-car trains, or 84 cars, will be in service. As cars will be out of service at certain periods for repairing and general overhauling purposes it has been estimated that 90 single-car units should be purchased.

TIME SAVING ESSENTIAL

Since time saving is one of the essential benefits of rapid transit, three time maps were prepared to show the time from Fountain Square to all other parts of the city. Similar information is given in Table II. A very appreciable saving will be made in the time to reach all rapid transit stations as compared with existing facilities. Where a transfer to surface transportation lines must be

made, the saving varies. The time for a trip by street car or bus is little different until a point between the 20 and 30-minute zones is reached. Beyond the 30-minute zone the time shows an appreciable saving if topographical conditions are favorable, though it should be remembered that the buses accomplish most of the time saving by running express and not accommodating local business.

The value of the time saved to riders who may use the rapid transit line is perhaps intangible. On an average each rider will save approximately 11.7 minutes each trip. This means that the rapid transit will save its patrons about 7,400,000 hours annually which they may use for work or rest or play. If time is worth 10 cents an hour the saving would mean

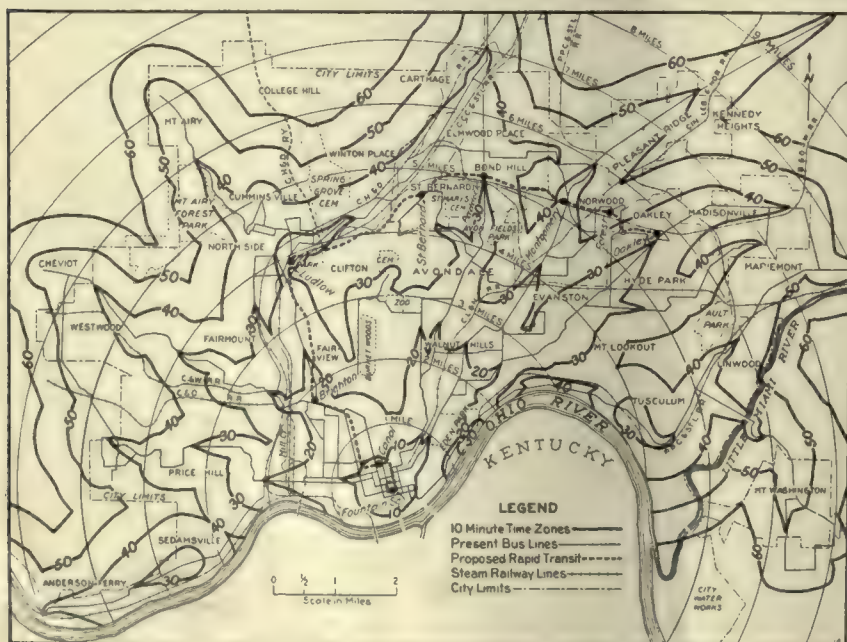
some \$3,700,000 per year to the citizens of Cincinnati.

Operation of the rapid transit system will be possible only provided all local transportation facilities are unified into one comprehensive system, and if there is a retentive by the unified system of all riders now using cars and buses. Practically all lines, both street car and bus, will be affected. On some lines it will mean a slight change in load only, brought about by transfer of riders to the new high-speed line. In territory served directly by the rapid transit line 26 out of 40 car lines will be affected. Six of the nine company bus lines and twelve of the sixteen independent bus lines are likewise affected.

An analysis of the present service was made to determine the demand for transportation under the changing conditions. Three-fourths of the independent bus lines are now operating in what will be rapid transit territory. With the advent of rapid transit the field for these bus lines will be filled by it, as patrons will find it quicker than other means. An analysis of the business shows that 49.1 per cent are potential riders on the new line. The losses sustained by the bus lines will vary from 10 per cent to 100 per cent. With half of the bus business

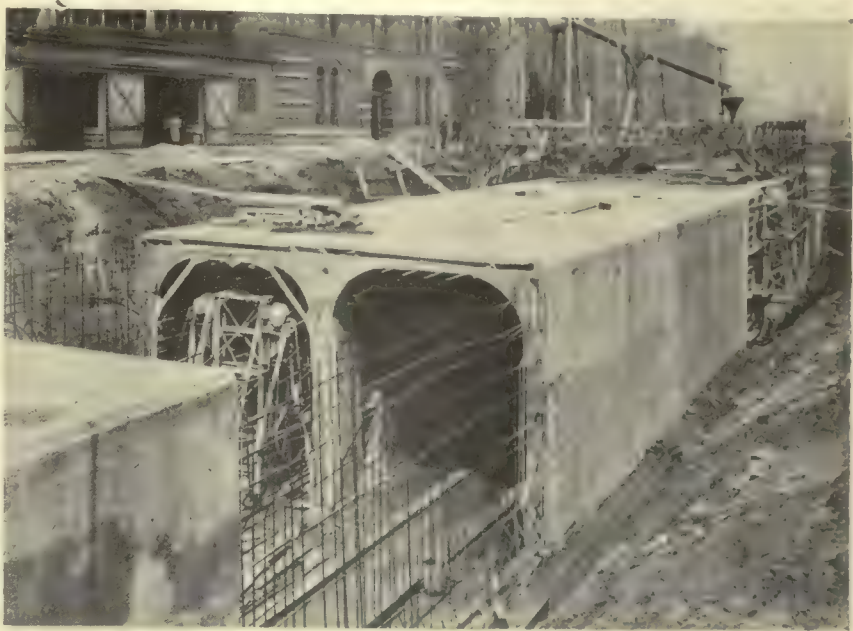
going to the rapid transit, operation of independent bus lines will no longer be justified or sufficiently remunerative to be continued. Some of the routes could be shortened or in that way continue to compete with the railway lines for the short-haul business. This would result either in wasteful duplication of service or drastic curtailment, either of which would be undesirable. Even if the independents could continue to operate, most of them would be of little value to the community served because they could not give the patrons the privilege of transferring to the rapid transit line, for at the outer ends of the lines their present traffic would find quicker service on the rapid transit line, while patrons along the inner sections of these lines would find little or no saving in time over street cars.

The present lines that will be affected by rapid transit and the pro-



Time zones from Fountain Square using present bus lines

posed rearrangement are shown in two maps on page 596. Three car routes should be discontinued and two new ones added. Seven present car routes should be revised to fit in with the new conditions. Three railway bus routes should be discontinued. Two independent bus routes should be continued but modified, and five new bus routes should be established to feed into the rapid transit stations. Two other bus routes should be revised. Eleven independent bus routes should be discontinued entirely and the passengers cared for by new lines feeding into the rapid transit stations and by the present street railway lines. Two suburban bus lines should be shortened, their city terminals to be at rapid transit stations. The report devotes considerable space to the details of the various routes, and indicates the exact changes that should be made in each. A summary of the cars and buses required under the present and proposed arrangements is shown in Table I. There will be a maximum reduction of 32 street cars and 97 buses, while the rapid transit system will



Central Parkway near Odeon Street. This shows a typical section of the subway line as constructed in the canal bed

that the amortization charge would be approximately \$14,000 annually. Approximately 3.19 miles of new track must be built

TABLE II—COMPARATIVE RUNNING TIME AND DISTANCES VIA STREET CAR, MOTOR BUS AND RAPID TRANSIT LINE

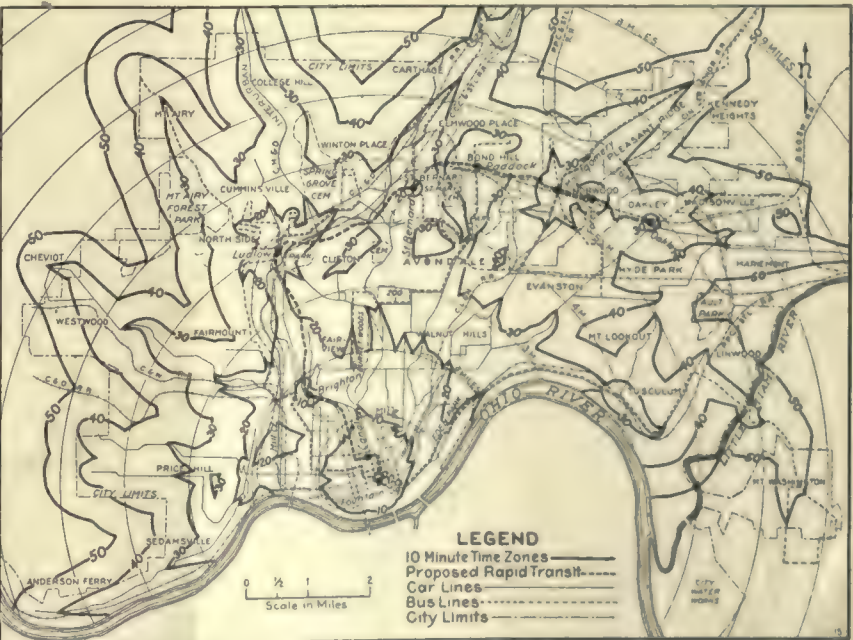
Station	Running Time, Via				Distance, Miles		
	Street Car Min.	Motor Coach Min.	Rapid Transit Min.	Sec.	Street Car	Motor Coach	Rapid Transit
Barton	15	15	6	00	2.15	2.44	2.22
Luow	28	25	11	40	4.75	5.15	4.80
St. Bernard	30		17	21	5.15		7.33
Pack	36	30	20	05	5.80	5.80	8.56
Montgomery	40	36	23	31	6.15	5.94	10.11
Fort	43	40	25	19	6.70	6.50	10.65
Only	42	35	28	00	6.62	6.55	11.86

TABLE III—SAVINGS IN OPERATING STREET RAILWAYS ALONE

	Annual Costs
Saving in surface railway operation if unified system can divert traffic to rapid transit line	\$312,250
Saving in bus operation	120,012
Totalsaving	\$432,262
Amortisation of abandoned track	\$14,000
Renewal and retirement of new track	10,000
Deduct total added charges	24,000
Net annual saving	\$408,262

require a maximum of 84 cars, none of which will be on the street surface or in any way interfere with or be interfered with by street traffic. The result of this should be a marked improvement in street traffic conditions in which the balance of street railway system, its patterns and the public generally will participate. The saving in car and bus miles, and the additional rapid transit car-miles, will be considerable. There will be a direct saving of 1,300,000 street car-miles and nearly 900,000 bus-miles with the addition of approximately 7,500,000 rapid transit miles. Some 300 fewer round trips by street cars into and out of the Basin, as well as some 1,300 fewer motor coach trips, will be made daily. Under the rearrangement, operation will be discontinued over 11.37 miles of surface track. The cost of elimination of this track would be a minimum of about \$166,000, possibly twice that amount, which would have to be expended immediately. The value of the track must not be amortized during the life of the franchise. It is estimated

at a cost of \$200,000. Assuming a 20-year life the annual amount required for renewal and retirement would be \$10,000.



Time zones from Fountain Square using rapid transit and co-ordinated surface transportation facilities



Present street car and bus lines affected by rapid transit line

Analyses of the savings to the street railway alone in surface operation according to the proposed plan show the summarized annual figures as given in Table III.

The net annual saving is applicable toward the payment of the operating expenses of the rapid transit line.

TABLE IV—ANNUAL OPERATING COST OF RAPID TRANSIT LINE ALONE

Maintenance of way and structures.....	\$83,500
Maintenance of equipment.....	162,000
Power.....	247,500
Trainmen's wages.....	200,714
Other transportation.....	123,000
Injuries and damages.....	55,843
General and miscellaneous.....	40,000
Depreciation reserve.....	149,945
Total.....	\$1,062,504

With the unified system and a discontinuance of excess competitive service 5,311,433 less miles would be operated annually by the independent buses, and this would be an



Proposed routing of street car and bus lines in conjunction with rapid transit line

additional economic saving to the community under the service-at-cost plan.

With the characteristics of the proposed rapid transit line determined, the estimate of the cost of operation given in Table IV was made.

This estimate includes operating the rapid transit line, including train, station and signal service and a sufficient allowance to cover depreciation on all depreciable property. Taxes and fixed charges are not included.

The total estimated cost of completing the rapid transit line, including the extension to Fountain Square, the equipment, real estate and construction for prepayment stations, necessary track changes in connection with the prepayment areas, construction of surface feeder track, together with interest, insurance and contingencies during the construction period, is \$10,606,960. Details are given in Table V on page 597.

Under any feasible plan of operation a rapid transit line cannot be made to pay from the start; neither can the true value of such an enterprise be determined solely from the financial results. To operate the rapid transit line independently would scarcely pay its operating expenses, to say nothing of interest and sinking fund charges. The number of passengers to be carried under present conditions would be but about 6,060,000 annually. The plan for unification of all the local facilities, street cars and buses, into one comprehensive system is the only practicable solution. Were this plan effective now some 38,000,000 riders would use the rapid transit line to advantage as they would save time in making at least a portion of the trip via the rapid transit line. These results can be expected only by adopting the unification plan in full. The service must be fast, frequent and regular.

Strong pressure will undoubtedly be brought to bear for the operation of the rapid transit stations which it is specified should be eliminated. Requests for other stations undoubtedly will be made. To make stops at the four stations eliminated would mean an increase of $4\frac{1}{2}$ minutes in the running time from Fountain Square to Oakley, reducing the schedule speed between terminals from 25.4 to 21.9 m.p.h. Three extra trains would be added, the extra equipment alone costing \$270,000. The time lost would destroy the usefulness of the line beyond Norwood and make the extension to Oakley impracticable. In addition there would be a loss of about 4,500,000 passengers annually who would not be attracted to the line.

Were it possible to make the rapid transit plan effective immediately, but with the independent buses continuing in operation, the operation of the unified system would result in a deficit of \$845,723 annually, if financed

ly 50-year serial bonds. On the other hand, could the independent bus lines be merged with the unified system immediately \$839,800 additional net revenue would accrue, exclusive of charges on the old rapid transit bonds. If it were possible to secure the new capital requirement under 50-year sinking fund bonds instead of 50-year serial bonds, the deficit of \$5,923 would be transformed into a balance of \$12,361.

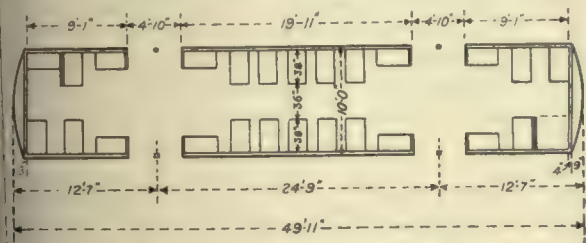
The rapid transit line, however, cannot be put in service before 1930. In the meanwhile, the most important question to be answered is what will result from discontinuing independent bus operation. There is a large investment in the 84 buses of the several independent lines affected by rapid transit, which must be paid for by somebody, and instead of loading up the subway and surface systems with the cost of buying them might be sounder economics to allow them to be operated for a reasonable time with a definite understanding between the city and the operators that the old equipment must not be replaced when it is worn out. On the basis of completely merging them in 1932, the estimate of Table VI on page 598 was prepared. It will be noted that while the revenue in 1930 is greater than now, operating expenses, taxes and fixed charges will have increased, the latter from \$2,171,184 to \$2,527,935, this change being due to the increase in the capital charges in the new financing of the street railway and restoring on



Hourly load demand at point of maximum traffic, rapid transit line

partial operation, a net deficit of \$246,111 will result for the year 1930. In the future, as traffic expands more will be added to plant and equipment account, which will still further increase these charges.

As operations continue, more and more business will gravitate to the rapid transit line. The year 1932 at least should witness a complete cessation of independent bus operations. In that year there should be a balance of \$136,704 from operation, which would be applicable to payment on the principal of the rapid transit debt. During 1933 a balance of \$243,824 is shown, and this increases at the rate of approximately \$120,000 per annum.



Plan of proposed rapid transit car

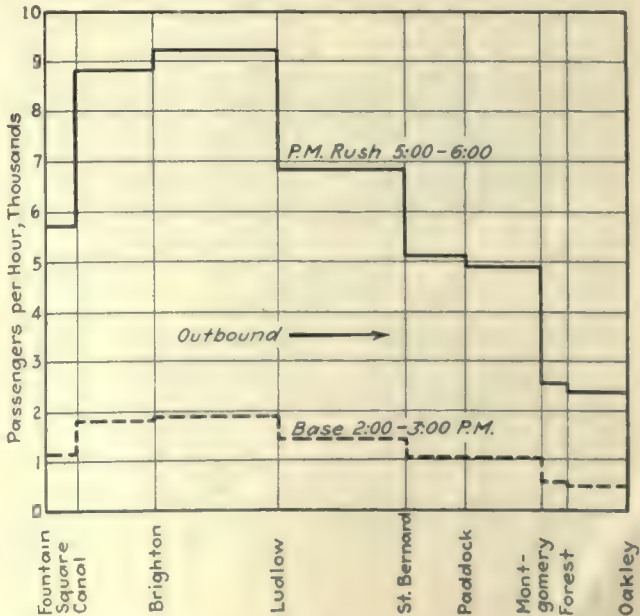
Nov. 1, 1928, the dividend rate on the capital stock which for three years was reduced from 6 to 5 per cent under the terms of the ordinance. Because of these factors and on account of the independent buses being yet in

ALTERNATE PLANS CONSIDERED

Several alternative plans were considered. These include the operation of the rapid transit line independently and also with its own system of bus feeders, but without any connection with the street railways. Operation of the present subway without the extensions proposed was figured for each of the test combinations. In all six plans were prepared. The comparative results for 1930 are given in Table VII, page 598. Plan No. 1

TABLE V—COST OF COMPLETING RAPID TRANSIT PLAN

1. Construction work, including station, of downtown extension from Central Parkway and Walnut to Fountain Square.	\$2,600,000
2. Completing construction work exclusive of track and equipment between Central Parkway and Walnut and Oakley. This includes constructing stations at St. Bernard, Paddock Road, Montgomery Road, Forest Avenue and Madison Road, and completing and finishing stations exclusive of equipment at Race Street, Brighton and Ludlow.	720,000
3. Lighting system for stations and tunnels.	125,000
4. Complete equipment of all stations including heating system.	275,000
5. Complete fire protection for tunnels and stations.	90,000
6. Ventilating system for tunnels and stations.	50,000
7. Paving right-of-way.	10,000
8. Construction of track with 100-lb. rail, cross-ties and the necessary special work including cross-overs, yard and shop tracks.	600,000
9. Construction of third rail and bonding of track and third rail.	330,000
10. Complete signal system including interlock track switches, signal towers and automatic block signals.	300,000
11. Distribution systems.	285,000
12. Expense necessary to provide for car storage, yards, shop facilities, etc., on property of the Cincinnati Street Railway at Mitchell Avenue.	100,000
13. Passenger car equipment.	2,025,000
14. Tricycles and work car equipment.	100,000
15. Real estate for prepayment stations.	750,000
16. Construction of prepayment stations including fixtures and lock changes.	500,000
17. Locating line at Knowlton's Corner including construction of roadway and station, right-of-way and damages.	716,000
18. Construction of surface line connection between Madisonville and Oakley.	125,000
19. Construction of surface track additions and changes recommended at Ivorydale and on Freeman Avenue.	75,000
Total.	\$9,776,000
20. Interest, insurance and contingencies during construction at 6 per cent.	830,960
Grand total.	\$10,606,960



Maximum load demands in afternoon rush outbound, rapid transit line. The inbound morning loads are quite similar

TABLE VI—ESTIMATED RESULTS OF FUTURE OPERATIONS UNIFIED SYSTEM SURFACE AND RAPID TRANSIT

	1930 (b)	1931 (c)	1932	1933	1934	1935
Revenue						
Combined surface and rapid transit	\$9,544,185	\$10,297,425	\$10,844,000	\$11,178,000	\$11,511,000	\$11,845,000
Operating expenses	6,666,000	7,160,000	7,480,000	7,666,000	7,827,000	7,995,000
Taxes	808,500	826,600	843,100	856,100	870,100	884,100
Net after taxes	2,069,685	2,310,825	2,520,900	2,661,900	2,813,900	2,965,900
Fixed charges						
Street railway	1,865,000	1,897,000	1,929,000	1,961,000	1,993,000	2,025,000
Net for rapid transit	204,685	413,825	591,900	700,900	820,900	940,900
Fixed charges						
Rapid transit (a)	662,935	670,858	678,003	685,202	692,186	698,932
Net after all charges (a)	(d) 458,250	() 257,033	() 86,103	15,683	128,714	241,968
Deduct payment on principal of rapid transit bonds	212,139	217,473	222,807	228,141	233,475	238,809
Net after all charges exclusive of money applied to purchase of rapid transit system (a)	(d) 246,111	() 39,560	136,704	243,824	362,189	480,777

(a) Includes interest and payment on principal under 50-year serial bonds to cover new capital necessary to complete rapid transit plan, but does not include fixed charges on old rapid transit investment of \$6,100,000. (b) Assumed that independent buses will carry 7,500,000 passengers during year. (c) Assumed that independent buses will carry 2,500,000 passengers during year. (d) Deficit.

is the one adopted, and which has been discussed in detail in the report.

While requiring the greatest amount to complete, Plan No. 1, the one recommended, is in reality the cheapest. Its net deficit is less and it furnishes the most comprehensive and economical solution of the city's transit problem. Plan No. 2, without the extensions, but with unified operation, would show nearly twice the net deficit. If considering only the amount of money to complete the rapid transit line, Plan 3, which calls for independent operation without the extensions, requires only \$4,386,330 additional capital. The cheapness is only apparent, as its operating expenses alone would exceed the revenue by 27 per cent. The net deficit would be even greater than that of Plan No. 1, which would carry ten times as many riders.

The deficits under plans No. 4 and No. 6 indicate clearly that if the rapid transit were to be operated as an independent line it would not support its own system of feeder lines to bring patrons to it under the present rate of car fare. A comparison of plans No. 1 and No. 2 with the others shows that the construction of the rapid transit extension to Fountain Square is well justified from a purely financial standpoint. It should also be remembered that the plan carrying most passengers will tend to improve its earning ability faster. The plan recommended, No. 1, will serve 66 per cent more people than any of the remaining five plans.

Since the Cincinnati Street Railway is operating under a service-at-cost franchise the people of the community have a direct interest in any matter influencing the business. For this reason the estimated results of operation of the various plans were carried out to determine the effect of each on the operations of the street railway. Any of the plans for independent operation of the sub-

way would throw additional burdens on the street railway.

Some attention is given in the report to methods of financing the rapid transit project other than the issue by the city of bonds under its present financing arrangement. It is pointed out that property values in uptown Manhattan increased more than 100 per cent in seven years, due largely to the installation of a rapid transit line. More recent lines have caused even greater increases. For this reason attention is called to the plan recommended in Pittsburgh and approved at a referendum by the voters of Detroit.

Briefly, the plan approved in Detroit divides the cost for financing the project into (a) the cost of what is termed permanent way, which in general includes construction cost, and (b) the cost of equipping the systems, which, as the name implied, includes the cost of all equipment necessary to operate the system. The cost of the latter is the car rider's proportion of the total cost, and is collected by charging a fare that will pay the cost of operating the service and of fixed charges on the equipment. The cost of the former, i.e., construction cost, is apportioned between the benefited property owners and the general taxpayer, the former paying 75 per cent and the latter 25 per cent. As worked out in Detroit, the benefited property owners pay 51 per cent of the total cost, the car riders 32 per cent and the general taxpayer 17 per cent. Since in Cincinnati charges on the old rapid transit bonds are all being paid for by the general taxpayer, it is believed to be only fair and just to all concerned that at least a part of the new capital requirements be secured by a direct assessment on the benefited property owners, and it is suggested that careful consideration be given this method as a means of partially financing the rapid transit line.

TABLE VII—COMPARATIVE RESULTS—VARIOUS RAPID TRANSIT PLANS—ESTIMATES FOR THE FIRST YEAR OF OPERATION—1930

	Unified Operations		Independent Operations			
	Fountain Square to Oakley Plan No. 1	Central Pkwy Walnut to Oakley Plan No. 2	Central Parkway and Walnut to Oakley Rapid Transit No Feeders Plan No. 3	Rapid Transit Bus Feeders Plan No. 4	Fountain Square to Oakley Rapid Transit No Feeders Plan No. 5	Rapid Transit Bus Feeder Plan No. 6
Total revenue passengers	110,350,000	105,490,000	3,636,227	8,355,043	6,060,379	13,925,072
Using rapid transit	37,400,000	22,460,000	3,636,227	8,355,043	6,060,379	13,925,072
Cost of completing plan	\$10,606,960	\$6,946,930	\$4,386,330	\$6,350,180	\$7,582,523	\$9,708,580
Revenue from operation	9,544,185	9,121,155	354,630	756,830	569,330	1,239,400
Operating expenses	6,666,000	6,572,860	449,967	962,666	495,058	1,068,703
Taxes	808,500	803,424	4,256	9,082	6,832	14,873
Net after taxes	2,069,685	1,744,871	(d) 99,593	(d) 214,918	67,440	155,824
Fixed charges						
Street railway	1,865,000	1,865,000				
Net for rapid transit	204,685	(d) 120,129	(d) 99,593	(d) 214,918	67,440	155,824
Fixed charges						
Rapid transit (a)	662,935	434,183	274,146	396,886	473,908	606,786
Net after all charges (a)	(d) 458,250	(d) 554,312	(d) 373,739	(d) 611,804	(d) 406,468	(d) 450,962
Deduct payment on principal of rapid transit bonds	212,139	138,939	87,727	127,004	151,650	194,172
Net after all charges exclusive of money applied to purchase of rapid transit system (a)	(d) 246,111	(d) 415,375	(d) 286,012	(d) 484,800	(d) 254,818	(d) 256,790

(a) Includes interest and payment on principal under 50-year serial bonds to cover new capital necessary to complete rapid transit plan, but does not include fixed charges on old rapid transit investment of \$6,100,000. (d) Deficit.



Exterior view of new light-weight city-type cars which were placed in service by Worcester, Mass., Railway Aug. 9.
These are almost identical with the Springfield cars

Springfield and Worcester Companies Introduce Latest Light-Weight City-Type Car

MARKED by special ceremonies in which civic and business organizations participated, an official demonstration trip was made in Springfield, Mass., Sept. 16, on two of the new one-man, two-man, double-end, light-weight, double-truck city-type cars which were part of the order of 50 cars placed by the Springfield Street Railway with the Wason Manufacturing Company last spring, as announced in the JOURNAL for March 26. A similar demonstration for the first of the 50 units ordered at the same time for service on the Worcester Consolidated Street Railway, at Worcester, Mass., was made on Aug. 9. As previously

noted in the JOURNAL, the Osgood-Bradley Car Company furnished these units.

In Springfield C. V. Wood, president; W. L. Harwood, engineer of power and equipment; H. M. Flanders, general manager, and other officers of the company had as their guests the Mayor of Springfield and other city authorities, presidents of business clubs and representatives of business organizations. They boarded the cars at the starting point, Vernon and Broadway, shortly after 10 a.m. A trip was made on some of the railway lines, including a portion of the system where an extensive piece of track reconstruction work rapidly nearing com-



Spacious interior of the Worcester cars which reveals some of the passenger comforts



Interior view of one of the Springfield units, showing roomy and attractive features

pletion. President Wood and some of the members of the party made a brief inspection of the work. From this point the cars returned to the center of the city, where the picture reproduced in this article was taken. The trip occupied approximately an hour and a half. There was every indication of the enjoyment and appreciation of the party of this progressive addition to Springfield transportation facilities. An hour after the trip one of the new cars was in operation on one of the principal streets in Springfield.

Twelve of the new cars had been delivered by Sept. 16. It is understood eighteen will have been turned over by the car builders by the end of last week and that the rate of delivery will be five a week until completion of the order. The car company is up to its schedule on delivery.

WORCESTER ALSO STAGED CELEBRATION

Prior to putting the first cars into service in Worcester the company took 30 invited guests, representing heads of city departments, the Mayor and Councilmen and business men of the city, for an hour's ride over the several routes. After the trip every one was enthusiastic and commented favorably on the riding qualities of the new car and the attention that the company and car builders had given to the minute details to make the units indicative of the attitude hoped for from the riding public. It is hoped that before the early part of October the entire order of 50 will have been completed. This, together with plans for rehabilitation of 100 of the latest type cars of the present fleet, will give Worcester nearly enough cars in good up-to-date condition to fill all wants, including rush-hour needs.

With the exception of certain details of equipment, which may be seen from the accompanying specification, the units for Worcester and Springfield are alike. The

outward appearance of the cars is strikingly attractive. They are constructed along graceful and serviceable lines, and afford the public high visibility, a decidedly favorable feature brought out by the color scheme. Truck and platform supports are black, the body is light yellow, the belt rail red. Above the belt and body posts is cream, over windows and vestibule light yellow, and the roof is red. The cars are of the low-level type, easy to board, and have rear treadle-door exits. They have commodious aisles and comfortable upholstered leather seats.

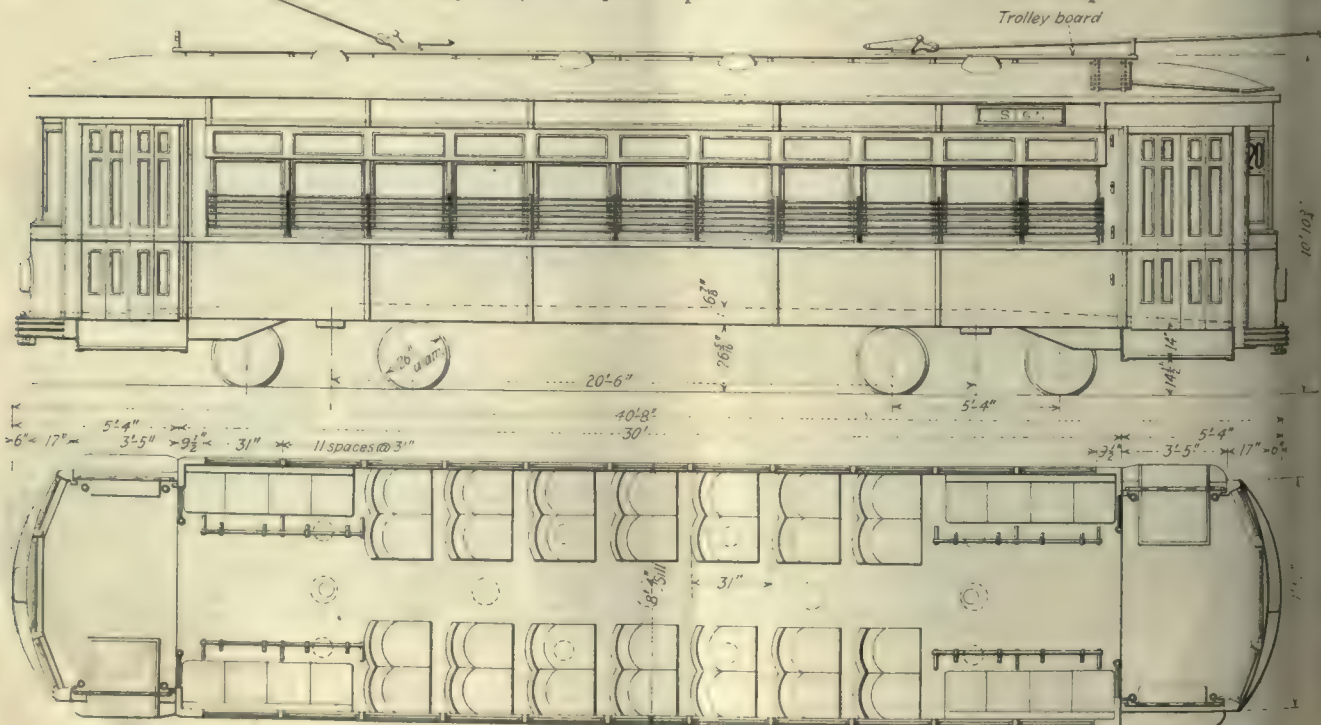
At first glance of the interior, from the standpoint of the public, an impression is given of roominess, abundant light, both artificial and daylight, and good ventilating equipment. There are four Druid glass 94-watt dome lights placed along the center line of the arch roof. Metal sash windows that can be raised so as not to obstruct the passenger's vision are one of the notable features. Ventilators are arranged on each side of the center of the roof, and the flooring is of linoleum. The units have 44 seats each, including sixteen longitudinal, four on each side at the front and back of the car. The motorman's seat in the rear can be reversed to give an additional place for a patron in the rush hour. The electric heaters under car seats are thermostatically controlled, and the interior trim of the units is African mahogany. There are no handles on seat backs, nor are there curtains on the car body windows. Rico retrieving hand straps are installed over the longitudinal seats at the ends of the car for standees. All piping for door engines and switch boxes is concealed.

NEW FEATURES IN DOOR CONTROL

Both units are equipped with treadle control doors and stationary steps; windows in front of the motorman are arranged to open out, and the top of the equipment cabinet on the motorman's platform is of aluminum. The four doors are of the two-panel folding type. Those at the right-hand front and left-hand rear corners are pneumatically controlled by engineer's valves operating light-weight door engines. Door engines are in flush-type panel boxes mounted over the top of the door. The

Seating plan and general dimensions of the Springfield, Mass., fifty units

The 50 units for Worcester are similar with the exception of a few major differences, among which are truck wheelbase, 5 ft. 6 in.; width over all, 8 ft. 5 1/4 in.; height of rail to trolley base, 11 ft. 1/2 in.





Official party on Springfield demonstration trip with two of the new light-weight city-type cars in the background. These cars are part of a 50-car order placed with the Wason Manufacturing Company

her two doors, although under the direct supervision of the motorman, are treadle-operated by means of an electro-pneumatic controlling and interlocking arrangement. In operation it is as follows: When used as a one-man car the right-hand rear door is hooked up so it can be treadle-operated after the brakes have been applied and the car operator has pressed the button on the top of the equipment cabinet. This is a new and unique feature of the treadle-operated doors. Pressing the button accomplishes two things—it draws the attention of the car operator to the rear door and it closes a circuit that interlocks the brakes with the rear door so that car cannot be moved until after the doors are closed. The seating of the brake interlocks in turn causes pneumatic switches to operate and to energize the treadle mechanism and hold the circuit on the brake interlock magnet. This circuit is not broken until the doors are

closed, when the brakes can be released by means of the engineer's valve.

When the car becomes a two-man car, there is a separate switch or door control handle that permits the conductor to open the treadle door from the rear platform. Likewise, by the insertion of a key from the street, the door can be opened from outside and the rear entrance used for loading purposes by a street fare collector. The same thing can be done when operating pay-leave on outbound trips.

The company has issued an illustrated leaflet for distribution to the public in which the operation is described in a simple manner. The method of display followed for destination signs is worthy of mention. At the car end a side sign is cut into the letter-board over the window and the 10-in. route number sign displayed in the right-hand vestibule window presents

DETAIL SPECIFICATIONS OF THE SPRINGFIELD AND WORCESTER CARS

	Worcester	Springfield		Worcester	Springfield
Type of unit.....	One-man, two-man, city, Same double-end, double truck	Same	Heater.....	Consolidated Car Heater	Railway Utility Co.
Number of seats.....	44	Same	Headlights.....	Crouse-Hinds Type 5	C. H. Ohio Brass
Model of car body.....	Osgood-Bradley Car Co.	Wason Mfg. Co.		D.P.	
Date of order.....	April, 1927	Same	Headlining.....	Never split	Same
Date of delivery.....	August, 1927	Same	Interior trim.....	African mahogany	Same
Weight car body.....	35,300 lb.	36,000 lb.	Journal bearing.....	Plain	Same
Wheel centers.....	20 ft. 6 in.	Same	Journal boxes.....	Symington	Brill
Length over all.....	40 ft. 8 in.	Same	Lamp fixtures.....	Elec. Serv. Sup. No. 23409	Same
Length over body post.....	30 ft.	Same	Motors.....	4 G. E. No. 265 inside hung	4 Westinghouse inside hung
Track wheelbase.....	5 ft. 6 in.	5 ft. 4 in.	Painting scheme.....	Yellow cream, red band	Same
Width over all.....	8 ft. 5 1/4 in.	8 ft. 6 in.	Register.....	International	None
Height of rail to trolley base.....	11 ft. 7 in.	10 ft. 10 1/2 in.	Roof material.....	Wood and canvas	Same
Window post spacing.....	31 ft.	Same	Safety car devices.....	Safety Car Devices Co.	Same
Body.....	Semi-steel	Same	Sash fixtures.....	Rex Curtain Supply Co.	Same
Roof.....	Arch	Same	Seats.....	Hale-Kilburn No. 392A	Brill
Door.....	End	Same	Seat spacing.....	31 in.	Same
Brake.....	G. E.	Westinghouse full safety	Seating material.....	Brown leather	Same
Shaft bearing.....	Plain	Plain Westinghouse	Slack adjusters.....	American Brake Co., Type J	Westinghouse piston traveler
Signal system.....	Faraday	Same	Steps.....	Stationary	Same
Compressor.....	G.E.C.P. 27 B	D.E. H16 Westinghouse	Step treads.....	Kass	Same
Controls.....	Flexible	Same	Trolley catchers.....	Ohio Brass	Same
Control.....	G. E. K-35 KK	Westinghouse	Trolley base.....	U. S. No. 20 Nuttall	Nuttall Roller Bearing No. 20
Controls.....	Metropolitan type	Same	Trolley wheels.....	U. S.	Nuttall Westinghouse
Destination signs.....	Hunter Keystone	Same	Trucks.....	Osgood-Bradley, Type O B C 45-66-J	Brill
Door mechanism.....	National Pneumatic	Same	Ventilators.....	Osgood-Bradley Car Co. exhaust	Brill
Doors.....	Folding	Same	Wheel type.....	Standard Steel Works	Same
Energy saving devices.....	Arthur power saving recorder	Same	Wheel guards.....	Wood	Same
File boxes.....	Johnson Type JT	Cleveland Lock Corp.	Special devices.....	Variable hand brake device, Folberth wind-shield wipers, door treads	Door treads
File covering.....	Linoleum	Same			
Gears and pinions.....	G. E. Grade M heat-treated	Nuttall			
Greases.....	Crystal	U. S. Gov. spec. 123			
Hold brakes.....	Peacock staffless	Same			
Hold strap.....	Rico No. 12	Same			

some interesting design refinements. Kranz safety device switches are included in the cabinet in the top of the motorman's platform.

On the Springfield cars the main motor resistance in the power circuit for operating the motors is the new type of ribbon wound on edge, cutting down the weight about three-quarters and space for locating it about one-half. Safety switches for the auxiliary control circuits, as lighting, heating, compressor control and buzzer circuits, have been installed, and are an innovation in Springfield cars. It is believed this is the first time a switch of this type has ever been put on any street car. It was made especially for these cars and is a development of a switch used on the experimental car that was conceived by President Wood and designed by W. L. Harwood, as stated in the JOURNAL of March 26.

Some of the major differences between the Springfield and the Worcester cars are that the former are equipped with Westinghouse motors, control, and air brakes, whereas the Worcester units have General Electric; trucks for Springfield are Brill and for Worcester Osgood-Bradley. For the purpose of comparison and to show the difference between the two units, the specifications released by the Osgood-Bradley company and the Wason company respectively are tabulated herewith.

The Readers' Forum

Experience with One-Man Cars Satisfactory

GENERAL ENGINEERING & MANAGEMENT
CORPORATION

NEW YORK CITY, Sept. 22, 1927.

To the Editor:

We note on page 445 of your Sept. 10 issue an article reciting the objections that the Los Angeles Railway has to operating its system with one-man cars. This article is of particular interest to us in view of a story sent you recently reciting the experience of the Scranton Railway.

The interest charges mentioned in the Los Angeles story probably include interest on the conversion of the entire equipment, plus charges for installation of signals, etc., and is considered reasonable.

However, several points mentioned in objection to the proposed operation are of interest to the entire street railway industry, as they may, if not rebutted, work a hardship on many companies who may be confronted with them by commissions or governing bodies before which they appear in an effort to reduce their operating expenses by one-man operation.

It is not our intention to criticise any street railway company, as we know there are often peculiarities of operation of which the outsider has no knowledge, but we wish to go on record from our experience, as follows:

Cost of breaking in men has been negligible with us. We have usually figured an average of five days.

If only 5 per cent of the present force cannot qualify as one-man operators it still leaves a tremendous balance in favor of one-man operation.

The additional supervisory force may be needed in a large railway, but this has not been the case in any of the companies under our management.

The difficulty of the operator being obliged to stop and pull switches and plug them and then remove the plugs is not an operating condition with which we are familiar. Electric switches at important points relieve the operator of such an adventure, and in outlying sections spring switches can usually be relied upon.

The additional hazard at railroad crossings is one which we emphatically deny. The hazard is not so great as that encountered by the operator of a bus.

The delays in case of accidents are present owing to time lost getting names of witnesses, but blockades can be more expeditiously handled with one man in control.

The increased possibility of hold-ups may be serious in some sections of the country, but the probability of a hold-up man assaulting a conductor has not been one of our major problems.

The city ordinances in regard to fenders is probably a serious handicap. We have found, however, that most city officials are glad to co-operate with us and permit the use of an improved type of life guard; and about 450 railway companies are now using them.

The speed of operation, in our experience, has not been influenced by the number of men on the car. Traffic conditions have everywhere affected speeds where cars must travel through the heavily congested parts of a town, and there often is a decrease in speed when the one-man car is in no wise to blame. The Wisconsin Railroad Commission, after extended observation in the Milwaukee Electric Railway & Light Company case, states:

We are convinced that the difference in actual running time between one-man cars and two-man cars is negligible and that the substitution of one-man cars for two-man cars will have no appreciable effect upon street traffic.

We are satisfied that the one-man cars can be operated as safely as two-man cars. We have discussed this feature many times in other decisions and will not enlarge upon it here.

Similar decisions have been rendered by various other commissions.

C. G. KEEN,
Railway Engineer.

A Correction on Paris Wages

CORRECTION should be made in the table of wages paid motormen and conductors on the Paris Surface Lines, as published on page 354 of the issue of this paper for Aug. 27. The correct figures follow:

Period	Monthly Wages in Francs	American Equivalent— Monthly	Yearly
First year.....	757	\$30.28	\$363.36
Next 1½ years.....	787	31.48	377.76
Next three years.....	807	32.28	387.36
Next three years.....	827	33.08	396.96
Next three years.....	857	34.28	411.36
Next three years.....	887	35.48	425.76

Note—Basis of exchange 1 franc = 4 cents.

Indiana Freight Business Expanding

THAT freight service on electric lines in Indiana is increasing is shown in the business being done by the Indiana Service Corporation at Fort Wayne. The depot is handling nearly 15,000 shipments a month. One month recently 997 cars were handled, 202 of which were through-bound cars. This depot is operated 24 hours a day except Sunday, with 32 men employed. The new station is located on High Street and was constructed at an approximate cost of \$400,000.

Maintenance Methods *and* Devices

Protecting Field Coil Leads from Iron Dust

CONSIDERABLE trouble was experienced at one time with short circuits in the field coils of the ventilated motors on some of the lines of the London Underground Electric Railway. The trouble occurred because iron dust from the brake shoes, rails and wheels would be drawn into the motors by the ventilating fans and would collect on the coils, where it was naturally very destructive to their insulation, particularly of the leads. Shellac was tried to overcome the difficulty, but did not prove very satisfactory as it would crack and flake, then the dust would get in. Short circuits of the kind described did not occur on the lines operating in the open or with the non-ventilated motors in tunnel service, but with the subway ventilated motors it presented a real problem.

tors, where Empire cloth alone is enough protection.

The advantage of this insulating paste or putty is that it can go into service in a plastic condition.

Cleansing Is Thorough in European Repair Shops

VERY thorough cleansing which truck and other parts receive when a car goes through overhauling at one of the repair shops is a feature of the repair shop practice of most of the European electric railways. It is not uncommon in this cleaning process to let these parts "pickle" in vats of soda or other chemical solutions or to be steamed to remove all paint, grease and other dirt before the car is put into service again.

Two of the accompanying illustrations show the tanks used for this purpose in the shops of the Hamburg

Elevated Railway, Hamburg, Germany. The illustration at the left shows one of these tanks and the end of another. Each tank is large enough to take in an entire truck frame. These tanks are filled with a solution, kept warm by means of steam pipes, of which soda is the principal ingredient. In the lower part of this tank is a grating on which the truck frame rests, while the cleaning process is going on. This grating is given a rocking motion to agitate the liquid and so free the truck from grease and dirt more easily. The truck frames are left in this tank for a sufficient length of time so that they come out quite clean.

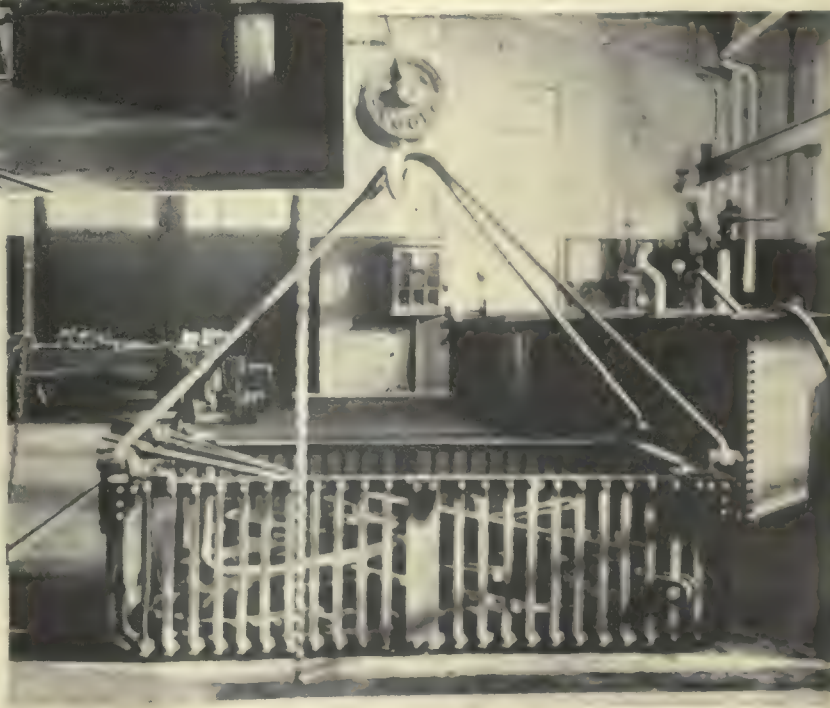
Small parts are put in the metal basket shown in the second illustration and are cleansed in the same way. Similar practice is followed in Berlin and other cities, and various cleansing fluids for this purpose are sold by dealers in chemicals. In Dortmund, Germany, where such a chemical cleaning tank is used, a pipe connection has been fitted near the bottom of the tank by which compressed air can be admitted to agitate the liquid.

In the repair shops of the London General Omnibus Company, prefer-



One of these pickling tanks are large enough to accommodate a complete side frame

Finally, the method was devised of protecting the exposed parts, like the field leads, with a paste made up of two parts of asbestos powder and one part of mica powder, which are mixed to the consistency of a paste. The use of gray enamel Megalac. This enamel is the material used in the Underground shops for coating the armatures. The paste is mixed with these three ingredients until it is about the consistency and appearance of putty. It is then held in by Empire cloth. Then tape is wound around the joint. This practice is not necessary with unventilated mo-



All metal parts of trucks receive a soda bath during overhauling at Hamburg



In London steaming is used for cleaning many of the large car and bus parts in the overhaul shop

ence is given to steaming. The third illustration shows the system used. The steam chamber shown is large enough to hold a pair of bus side frames. In this particular view a workman is welding the side frame before it enters its Turkish bath. Incidentally this process, like most others in the Chiswick repair shops of the London General Omnibus Company, is carried out on a moving belt conveyor. The motion is a continuous though a slow motion, and while the part, in this instance a bus frame, is on this conveyor the various necessary repairs are made by the workmen, who remain in the same place. The welding and steaming, shown in this particular illustration, are but two of the processes which this bus frame undergoes while it is on this moving platform.

A bolt in the axle caps of the motor is worth two in the bushes along the roadbed.

and supports, in addition to the air cylinder, the base and laminated section of the transformer. The top of the transformer core is hinged so that it may be raised by air pressure to permit the coil under test being slipped over the vertical leg. Also, connected to the piston of the cylinder is the ram, cut away to slip over the core of the transformer and exert

pressure on the coil that is under test.

In operation, the coil is slipped over the exposed leg of the transformer core. Then air is admitted to the cylinder, lowering the head to the coil and at the same time bringing the top portion of the core in contact with the leg. This closes the magnetic circuit. With the coil under a pressure of approximately 2,000 lb., the primary coil of the transformer is connected to the a.c. circuit. The current is indicated on an ammeter. Shorts or open circuits in the coil under test result in abnormal or subnormal rating on the ammeter.

Field Coils Tested Under Pressure

USE is made in the shops of the Portland Electric Power Company of an apparatus to test field coils for short and open circuits while they are subjected to a pressure similar to that which exists when the coil is bolted in position in the shell. An air cylinder and shoe compress the field coil while it is being subjected to the customary alternating current electrical test in an open transformer. The simplicity with which the apparatus operates is the outstanding feature.

The frame which carries the air cylinder is built up from the ground



Testing field coils under pressure in Portland, Ore.

Apparatus used in Portland, Ore., to test field coils under service conditions. The air cylinder applies a pressure of approximately 2,000 lb. to the coil while it is in the magnetic field of an alternating cur-

rent transformer. Variation in the current flowing through the primary coil of the transformer indicates shorts or open circuit in the coil under test. At left, open position. At right, closed position.

New Equipment Available

Electrically Driven Arbor Saw

BEARS and belts are eliminated in a new type direct-driven arbor saw placed on the market by the Gallmeyer & Livingstone Company, Grand Rapids, Mich. The machine has a 30-in.x3-in. table, machined and fitted with a removable throat plate to allow for the use of a dado blade, grooving saws, etc. The table tilts up to 45 deg. and may be locked at any desired setting. A dial with graduations and a pointer indicates the position of the table. A stop facilitates a quick and accurate return to the horizontal position. A cross-cut gage can be used on either side of the saw, two slots in



Portable direct-driven arbor saw

table being arranged for this purpose. The gage can be set at any angle and clamped rigidly. Holes are provided for mounting an auxiliary wood face piece when such action is desirable. The ripping gage is machined on both sides and can also be used on either side of the saw. Tightening of the lever head screw locks the ripping gage in position and lines it up automatically with the saw. A guard to protect the operator is placed over the saw and can be set for any thickness of stock. A splitter guard also

keeps the stock from pinching the saw. The saw may be raised and lowered from flush with the table to high enough to cut 2½-in. stock. The pedestal is a heavy one-piece casting fitted with two rollers at the back and two stationary feet at the front to give a firm foundation when in operation. When the handle is pulled forward in a position for moving the machine a cam lifts the feet from the floor automatically and brings the weight of the front of the machine on to a third roller, which is carried on a swivel bearing moving with the handle. This makes the machine portable.

Correct pressure on a brush holder spring hammer will avoid many a flashy and costly repair.

Extension for Spray Painting

FOR painting cars, ceilings and high, inaccessible places an extension for a spray painting gun has been developed by the Alexander Milburn Company, Baltimore, Md. It grips the standard Milburn gun, which while in use can be swiveled to any desired angle. The section is 8 ft. long and with the operator's reach will spray the paint to an approximate height of 14 ft. Other lengths of extensions will be furnished if desired.

For painting within arms' length the gun is immediately detachable and can be used. A slight pull on the operating handle of the extension operates both the air and the levers on the spray gun simultaneously. The paint under pressure flows to the atomizing chamber, is expanded and driven into the pores of the surface to be covered.

The extension unit consists of the extension and standard type gun, pressure feed tank with the regulators, etc., 25 ft. of air hose, 25 ft. of paint hose and hose with connections to the



Extension arm applied to paint spraying gun

compressor or pressure container. The extension is constructed ruggedly of strong tubing and has the gun and angle control close to the bottom for easy manipulation. It is light in weight, well balanced and can be handled easily.

Increased Efficiency in Floodlight Projector

BY IMPROVED design greater efficiency is obtained in a parabolic shaped reflector of 24 in. diameter just announced by the Crouse-Hines Company, Syracuse, N. Y. The reflector intercepts and redirects into the beam a greater portion of the lamp rays than has heretofore been obtained.



Type LCE-24 floodlight projector with hood recommended for railway yard lighting

The case is made of special cast aluminum alloy to resist corrosive gases. It is practically airtight, the large radiating surface making the usual ventilators unnecessary. This feature prevents dust and dirt from getting into the case and collecting on the reflector. The door and the case are ground to fit so that no gasket is necessary.

By means of two simple adjustable stops the projecting case can be released from its position, tipped completely over or turned around for cleaning and lamp renewal and then returned to its original position. This makes it unnecessary to refocus the projector every time a lamp is renewed or the lens cleaned. This is especially convenient when the projectors are mounted on the edge of a tower, ledge or roof.

When used for railway yard lighting, the floodlight projector can be supplied with a 15-in. hood to throw the stray light beneath the tower. This also prevents soot from falling on the lens.

News of the Industry

Union Men Advertise Service at Their Own Expense

An appeal from the trainmen of the Tide Water Power Company at Wilmington, N. C., addressed to the general public in behalf of their employer's business, appeared recently in the *Wilmington Star* in the form of a large advertisement which accentuates the peaceful revolution taking place in the relation of employer and employee in the industry. The advertisement was written and paid for by the members of the Amalgamated Association, and occupied a space three columns wide by eight inches deep. It was as follows:

REQUEST

*An Appeal from the City Lodge
No. 708*

The Members of the Amalgamated Association of Street and Electric Railway Employees of America, Division No. 708, of Wilmington, N. C., employed on the city and suburban cars of the Tide Water Power Company, is paying out to its employees in Wilmington

Every month more than \$36,000. Every twelve months more than \$432,000.

This money is largely spent in Wilmington as a big factor in keeping Wilmington going.

OUR APPEAL

Is to ride the cars which we are operating so as to enable the company to maintain schedules and operate more cars, thereby giving more men work and making a larger payroll for Wilmington.

We, the members of the Amalgamated Association, earnestly solicit your patronage as passengers on the cars which we operate and shipment of freight and express over our line. We are endeavoring to carry you safely and on schedule to and from your work or to your destination. We have an interest in our work and in serving you and we trust that you will help us and help Wilmington by riding the cars which we operate. This will increase the number of employees, therefore making the payroll in Wilmington larger by patronizing the transportation system of the Tide Water Power Company.

This advertisement is written and paid for by the members of the Amalgamated Association of Street and Electric Railway Employees of America, Division No. 708.

Safety-Conscious School Children in Atlanta

At the request of the superintendent of the Atlanta, Ga., public schools, the Georgia Power Company will this year detail several men to visit every school in the city and tell the children about safety methods.

Last year an official of the company

conceived the idea of reducing accidents, particularly among children, by having two trainmen visit the different city schools and talk for a few minutes on safety. After a considerable argument the Board of Education was finally sold on the proposition and two trainmen, themselves the fathers of several children, were taken from their cars and detailed to the work of talking to the children in the city schools.

The two men visited the different schools and were given a few minutes at chapel exercises. So good an impression did these men make and so important did the school board consider the work that the superintendent wrote President Arkwright asking that he detail speakers to talk to the children every year.

In addition to lowering the number

of accidents to children, which was the main object of the speaking campaign, the plan accomplished other and scarcely less important things. It showed the children and their parents that the street car company was something more than a "soul-less corporation" as had been pictured. It demonstrated that the company really had the safety of the children at heart. It got the attention of the children themselves and built up a kindly feeling for the company. And it taught them valuable safety habits for every-day use in riding on the street cars and crossing the streets of the city.

Officials of the company consider the expense of taking the speakers from the cars and filling their places with substitutes negligible compared with the splendid results obtained.

Recapture Advocated in New York City

Unification of transit lines with non-political control advocated by special counsel for Transit Commission—Cost put at \$196,000,000—Surface lines ignored—Not all rapid transit lines involved

SAMUEL UNTERMYER, special counsel for the Transit Commission in its investigation of the New York transit situation, has rendered a report to that body in which a summary of the recent hearings is given and recommendations are made for a plan of transit unification. Many interesting exhibits are included to support the text and recommendations. The summary was made public on Sept. 26. It is not expected that the plan in detail, a book of several hundred pages, will be ready for distribution for another week or ten days.

Mr. Untermyer recommends the recapture of the lines of the New York Rapid Transit Company, subsidiary of the Brooklyn-Manhattan Transit Corporation, and the termination of the lease under Contract 4 between the city and the New York Rapid Transit Company on Dec. 31, 1928, and that notice should be served on the company by the city to that effect.

A similar notice of recapture and the termination of the lease between the Interborough Rapid Transit Company and the city and the termination of Contract 3 between that company and the city is recommended. But simultaneously with such notice to the Interborough Rapid Transit it is recommended that an offer be made to buy the Interborough Rapid Transit and its leased Manhattan Elevated property by the exchange of New York City bonds, aggregating \$245,594,000, for the securities

of the companies. The exchange of securities recommended is on the following basis:

\$148,762,000	3½ per cent city bonds for I.R.T. outstanding 5 per cent mortgage bonds.
33,832,000	3½ per cent city bonds for I.R.T. outstanding 7 per cent notes.
10,500,000	3 per cent bonds for I.R.T. outstanding 6 per cent notes.
10,500,000	3½ per cent city bonds for I.R.T. stock at \$30 a share (\$350,000).
42,000,000	3 per cent city bonds for Manhattan Railway Company's stock at \$70 a share (600,000).

The city bonds would have a sinking fund attached which would retire them at maturity. In event such an exchange of securities materializes, it is recommended that at least that portion of the city bonds exchanged for company bonds and notes be exempted from the debt limit by securing an order of the Appellate Division of the Supreme Court of New York.

Legislation should be sought, according to Mr. Untermyer, granting to the commission and the city the right through the courts to condemn by the power of eminent domain such company property as may be required by the city to carry out a unification plan. Presumably this power might be used in connection with condemning the Sea Beach and Brighton lines of the Brooklyn-Manhattan Transit in case the city could not secure trackage rights over those lines.

In event the New York Rapid Transit Company does not notify the city 30

days after notice of recapture that it is willing to accept the terms of such recapture, it is recommended that the city begin a suit for a declaratory judgment to determine the right of the city to terminate Contract 4 and the amount payable by it to the company.

If the Interborough Rapid Transit does not accept the offer of purchase made by the city within two months after it has been authorized by the city, the latter should then continue its proceedings for the recapture of the recapturable portions of that property.

BOARD OF TRANSIT CONTROL

Formation of a corporation with authority to lease from the city such transit lines as it may own or acquire is recommended. The corporation would have nominal share capital, if any, and the right to issue bonds and other obligations. The board of directors would consist of nine members. The chairman of the Board of Transportation would be chairman of the board and a director. The comptroller of New York City would be a director and a third would be named by the mayor. The Real Estate Board of New York, Merchants Association of New York, Brooklyn Chamber of Commerce, Queensboro Chamber of Commerce and the Bronx Board of Trade and Bronx Chamber of Commerce, acting together, would each submit a nominee to the Transit Commission, which would in turn name such nominees as directors. The Borough of Richmond will have a representative on the board when the subways are extended there. The terms of directors will be from four to six years. Eight directors selected as above shall elect the ninth member. The mayor will be an ex officio member of the board without voting power. The ninth director selected as above described will be president of the corporation and must be an operating man of not less than ten years' experience. Directors will serve without compensation, excepting that \$50 will be apportioned among them at each meeting of the board to the exclusion of the chairman, president and comptroller. Salaried officials will include the president, one or more vice-presidents and other minor officials.

This plan of control does not look toward municipal operation, says Mr. Untermyer. He recommends that the lease from the city of its constructed and acquired subways to the new corporation be for 25 years and that such subways be operated on a 5-cent fare until and unless otherwise required by law.

REFERENDUM PROPOSED

Mr. Untermyer suggests that the following proposal be submitted to a referendum vote:

Do you favor the repeal of the existing law so as to assure the continued maintenance of a 5-cent fare on the city-owned and operated transit lines as between the riders, the taxpayers and the owners of the properties benefited, after all private interests in the properties have been eliminated, if it should hereafter appear that the maintenance of such fare yields and may

continue to yield less than the cost of service, and that it will or may involve annual deficits that must be met by taxation.

The law referred to in the above-proposed referendum is that of 1924, which requires that the fare be readjusted upward if during the third year of municipal operation of a road the gross revenues are not sufficient to cover operating expenses, fixed charges and amortization costs.

Mr. Untermyer's report contains various exhibits tending to show that the new city system now being constructed when joined with the recapturable portions of the existing privately operated properties will make a self-supporting system on a 5-cent fare within a comparatively short time. He says:

If the new city subways are compelled to increase the fare to, say, 7 cents, will the existing rapid transit lines be likewise permitted to increase their fare and thus penalize 79 per cent of the car riders and incidentally add the huge sum of \$44,000,000 a year to the revenues of the present privately owned companies? If not, how can the new city subways hope to get their share of the traffic or to relieve the existing congestion? . . . I do not for a moment admit that the new city subways when joined with the recapturable properties will not make a self-supporting system on a 5-cent fare within a comparatively few years. The proofs are to the contrary.

SURFACE LINES WOULD NOT BE INCLUDED

Mr. Untermyer would exclude surface lines from the proposed unification of rapid transit lines because, among other reasons, they are losing money and "it would involve the impossible task of separate negotiations with each of the 43 companies included in the seventeen separate operating systems."

Representatives of the Brooklyn-Manhattan Transit Corporation are expected to contend in court that the city cannot recapture until ten years after the completion of the Nassau Street subway, construction of which has not yet been started, on the ground that its contract with the city gives it trackage rights which the city cannot furnish until the Nassau Street subway is built.

The B.-M. T. also will oppose condemnation of its Sea Beach and Brighton elevated lines, on the ground that such condemnation would be unconstitutional. It also will oppose legislation for condemnation, which Mr. Untermyer has suggested.

The officials of the company also intend to appeal to popular sentiment, particularly in Brooklyn, against recapture of the B.-M. T. subway system, which they assert would result in a disruption of the present Brooklyn rapid transit service and leave many sections without transportation to midtown or uptown Manhattan without payment of an additional fare. Another argument which spokesmen of the B.-M. T. intend to use in an appeal for popular support against the plan is that the city cannot find the \$196,600,000 needed for the recapture plan.

James L. Quackenbush, general counsel of the Interborough, said he did not

care to discuss Mr. Untermyer's report.

John H. Delaney, chairman of the Board of Transportation, who is Mayor Walker's chief adviser on transit matters, approved the Untermyer report in principle, but said that there undoubtedly would be changes in minor details, as the plan suggested by Mr. Untermyer in his report was only tentative. In the presence of Daniel L. Ryan and Frank X. Sullivan, the other members of the board, who gave general acquiescence to his views, Mr. Delaney said:

There are three big points about the plan. It preserves the 5-cent fare, it assures public control and it eliminates stock speculation. The entire Board of Transportation is heartily in accord with the report in principle.

The city has not money enough within its debt limit right now to pay \$196,000,000 for recapture, but it will take a year to work out the proposals and before they can be put into effect.

If the city decides to put the money into recapture of the lines, this will affect the debt limit only temporarily. The entire investment which private capital now has in the lines which it is sought to recapture is self-supporting. The returns which the railroads are securing are sufficient to carry the investments by the companies. We would be changing the form merely and it would throw no additional burden on the city.

We know that the B.-M.T. subway system is showing a profit to the company. So far as the Interborough is concerned, the earnings of its East Side and West Side subway lines are all thrown into one pot at present. If we decide to recapture the Interborough East Side subway, it would take a year to allocate the earnings of that system before we could go to the court to have the city's investment in that line exempted from the debt limit and demonstrate what its earnings were.

I am pretty well satisfied with the whole idea of the plan. I suggested this idea of a quasi-public service corporation a year ago in an address before the Municipal Club of Brooklyn. It is very gratifying to find that Mr. Untermyer has found a way out and has reached a solution without municipal operation.

We are not so much concerned with municipal operation as we are with getting away from private exploitation.

CHAIRMAN RECOMMENDS CAREFUL STUDY OF REPORT

Dwight W. Morrow, chairman of the committee formed to represent the bondholders at the time the financial structure of the Interborough Rapid Transit Company was readjusted, issued this statement on Sept. 28:

An informal meeting of the committee of Interborough bondholders was held today and there was discussed the report and recommendations of Mr. Untermyer, the special counsel to the Transit Commission, on the proposed plan of readjustment. It recognized that this report is preliminary in character, but the committee is of the opinion that the plan should be given careful consideration and that everything should be done by the representatives of the bondholders to aid the Transit Commission and its counsel in its efforts to work out the complicated task imposed upon the commission by the Legislature.

Mr. Morrow's statement was issued late in the day at the offices of J. P. Morgan & Company. J. P. Morgan is

the nominal head of the committee, but Mr. Morrow has acted as its chairman since the readjustment in the Interborough's affairs on May 1, 1922. The committee was formed to further the interests of owners of first and refunding 5 per cent bonds, of which \$150,000,000 are outstanding, and of three-year secured convertible 7 per cent notes.

Meanwhile the Citizens Union has opened an attack on the proposed constitutional amendment, to be voted on in November, by which \$300,000,000 of city bonds would be released from debt limit consideration and the money used for subway construction. The union utilized Mr. Untermeyer's report as a basis for its attack. In part the statement read:

The report of Mr. Samuel Untermeyer to the Transit Commission throws a flood of light upon the real purpose of the constitutional amendment to increase the city's borrowing capacity, which is to be voted upon at the coming election.

The statement then quoted Mr. Untermeyer's fifteenth recommendation, which was to the effect that everything possible should be done in order that public approval of the proposed amendment could be obtained.

Thrift Conspicuous in St. Louis

After the stockholders of the United Railways Savings & Loan Association, controlled by employees of the United Railways, St. Louis, Mo., had voted to increase the capital stock from \$11,000,000 to \$12,000,000 the board of directors declared a six months dividend of \$114,000.

The association, formed twelve years ago with 126 members to encourage thrift and home owning, was authorized at the outset to issue capital stock for a gross value of \$1,000,000. Today the association has 6,000 members and assets of \$4,500,000. In August, 1927, the receipts of the association were \$200,000 and loans \$165,000.

Railway Exhibit in Rochester Includes Instructive Scenario

A film which features the New York State Railways exhibit at the annual Rochester, N. Y., Exposition shows how the present electric railway lines in the city follow the old Indian trails. This scenario was written by Leon R. Brown, editor of the *Transportation News*, house organ of the Rochester lines of the railways. The picture is part of the industrial course for public school pupils.

The railway's exhibit also graphically shows the toll in street accidents through carelessness of motorists and pedestrians by means of a film, in a trolley car, which is entitled "What the Motorman Sees." This depicts the many close calls the man at the controller experiences during the course of the day's work.

COMING MEETINGS OF Electric Railway and Allied Associations

Oct. 3-7—American Electric Railway Association, annual convention, and exhibit, Public Auditorium, Cleveland, Ohio. Exhibits open at noon of Oct. 1.

Oct. 4—American Automobile Association, Motor Bus Division, Cleveland, Ohio.

Oct. 18-21—National Association of Railroad and Utilities Commissioners, thirty-ninth annual meeting, Baker Hotel, Dallas, Tex.

Oct. 26-27—Public Utilities Association of West Virginia, annual convention, Parkersburg, W. Va.

Oct. 26-27—Society Automotive Engineers, Transportation Section meeting, Hotel Sherman, Chicago, Ill.

Ohio Safety Councils Will Hold Monster Meeting

Representatives of utility companies, industrial plants and safety councils from all over Ohio will hold a two-day safety congress and exhibition in Columbus on Nov. 10 and 11.

There are about 200 plants and other companies in Ohio now doing safety work, with the result of a reduced rate

to employers for claims amounting to \$1,250,000. The congress and exhibition will show how this great saving was accomplished and the methods used in prevention of accidents.

Sick Employees of Pacific Electric to Have Added Comforts

The New California Lutheran Hospital of Los Angeles, Cal., is to be the official headquarters for afflicted employees of the Pacific Electric Railway. This new hospital to care for the sick and injured will have many improvements over the previous hospital facilities. Through negotiations concluded by Dr. Weber, chief surgeon of the medical department, and approved by Vice-President and General Manager Pontius, the \$1,500,000 edifice will become available to all of those whose names appear on the official payrolls. It was announced that dependent family members of employees are to be granted a special rate in the two and four-bed wards at the low rate of \$3.75 per day for hospitalization.

Dr. Weber's staff has been augmented in many ways so that at the present time practically every disease or injury can be cared for in an efficient and thorough manner. The scope of the medical department has been extended not only to the very numerous disorders and injuries to which human flesh is heir, but also to dental service.



Officials of New York State Railways and city of Rochester on inspection trip over new subway railroad in bed of abandoned Erie Canal. The cars were the first operated by electricity over the new line

Front row, left to right: Charles E. Ogden, secretary to the Mayor; Charles R. Barnes, City Commissioner of Railways; Mayor Martin B. O'Neil, John P.

Morse, chairman of the Citizens' Committee on Subway Operation, and James F. Hamilton, president of the New York State Railways.

New Orleans Has 100 Per Cent Safety Day

For the first time in its history the New Orleans Public Service, Inc., New Orleans, La., established a 100 per cent transportation safety record on Sept. 20. During the 24 hours ending at midnight not a single accident was reported. In that period 399 cars were operated over 38,966 miles of tracks, 22 buses over a mileage of 2,866 and approximately 395,000 passengers were carried. New Orleans has a population of 425,000.

The nearest approach to the perfect record was made on several occasions when only two accidents were reported during an entire day. The term "accident" does not necessarily mean bodily injury, but covers all forms of complaints, where a report is required to the company.

New Services Planned in Maine Sections

The York Utilities Company, Sanford, Me., operating between Biddeford and Sanford via Kennebunk, discontinued service on Sept. 15. Service in Sanford over York tracks will be confined to a 5-mile route between Sanford and Springvale. The bus line from Sanford to Biddeford via Alfred will continue to operate, and also the Sanford-Springvale bus line. The company is also seeking approval of a petition to operate buses between Biddeford and Kennebunkport. Citizens of Sanford wish to have the electric railway operate between Sanford Square and Lion Hill for the benefit of mill employees. The Biddeford & Saco Street Railway is planning to use York Utilities rails in Biddeford between City Square and Proctor Road. It is the intention of the Biddeford & Saco company to lease the route from month to month. If the line proves profitable, a long-time lease will probably be negotiated.

Safety Work Expanding in West Virginia

The Monongahela West Penn Public Service Company, Fairmount, W. Va., which is extending its safety work throughout its territory, will hereafter devote at least one page of *Courtesy and Service*, its magazine, to news of the safety and accident prevention work. President Alexander and others are giving valuable suggestions and assistance to the safety director in co-ordinating the safety program with other activities of the company. At various places on the properties, such as carhouses, garages, power plants, substations, linemen's rooms, trainmen's rooms and shops, safety suggestion boxes have been installed. With these boxes will be provided pads for safety suggestions. This is an invitation to all employees of every department to submit suggestions which, in their opinion, will make for greater safety or eliminate hazardous conditions

or practices now existing. Employees are urged to submit suggestions, every one of which, according to the statement of the company, will receive attention and, if worthy, will be put into effect. If it cannot be carried out the reasons why will be given to the one making the suggestion.

Hearings Begun on North Shore Rate Increase

Hearing of evidence on the application of the Chicago, North Shore & Milwaukee Railroad to the Interstate Commerce Commission for permission to increase rates for intrastate travel in Illinois and Wisconsin on a par with its interstate rates began in Chicago Sept. 21 before Examiner Hoy. L. E. Butler, assistant to the vice-president, testified that interstate rates on the North Shore line were recently increased to 3.6 cents a mile, while intrastate fares in Illinois and Wisconsin still remained at the 3-cent level. The proposed increase in rates, he explained, would not affect commutation tickets and was made necessary by the strong competition under which the road operated with steam lines.

Baltimore Riders Read About Iron Horse

In the Sept. 22 issue of *Trolley News*, the car pamphlet of the United Railways & Electric Company, Baltimore, Md., an interesting story is told entitled "The Fair of the Iron Horse," the pageant and exhibition of the Baltimore & Ohio Railroad, in commemoration of its hundredth birthday. When spread out the folder on one side is a map showing the car and bus line connections to the Fair Grounds.

Utility Subjects to Be Discussed Before Florida Students

Lecture courses in all of Florida's higher institutions of learning will be conducted this fall by speakers to be furnished by the Florida Public Utilities Information Bureau. The lectures delivered at the University of Florida were made following special invitations sent to the experts by the executives of the school. Lectures as planned by the committee, it was stated will be of much assistance to the students.

Col. Peter O. Knight, Tampa attorney, and John P. Ingle, manager of the Jacksonville Traction Company, recently lectured at the University of Florida. Robert J. Holly of Sanford is director of the bureau, Mr. Ingle is chairman of the executive committee.

For the past several years many lectures have been delivered by public utility experts in Florida before classes at the University of Florida, at Gainesville, and with the announcement of the committee's lecturing program, invitations for the speakers are expected to come from all the state institutions.

Further Efforts to Make Safety a Reality

White lines indicating how far the rear end of a street car will swing while making a curve are being painted on all downtown street intersections in Atlanta, Ga., by the Georgia Power Company. Motorists and pedestrians who stay clear of the line are out of the danger zone. Safety experts say that the lines will prevent a number of yearly street car accidents as well as speed up the cars, often delayed by traffic in turning corners.

New Franchise for Omaha to Be Submitted

Preliminary conferences between the members of the City Council of Omaha, Neb., and representatives of the bondholders and stockholders of the Omaha & Council Bluffs Street Railway have resulted in an agreement to submit a new franchise at a special election to be held on Jan. 10, 1928. As tentatively agreed upon the franchise will have a life of 30 years; it shall not be exclusive, but will give the Council the right to license buses and other forms of city transportation; it shall be subject to the exercise by the city of all future powers conferred upon it. It provides that the right to the use of the streets shall cease whenever the franchise terminates, and that city firemen and policemen and mail carriers in uniform and on duty be carried free. A proposal to retire half the bonds in twenty years was voted down.

Freight Service in Utah Authorized

The Bamberger Electric Railroad has been authorized by the Public Utilities Commission of Utah to operate a pickup and delivery freight service in less than carload lots at its terminals, Salt Lake City and Ogden. The application was protested by the Salt Lake-Ogden Transportation Company, an auto truck line, but the commission held that there was no good reason why such permission should not be granted if shippers desired this service.

Lower Fare Sought on Atlanta Line

A petition of patrons of the Oglethorpe University car line asking for a unit fare of 7 cents between Oglethorpe and Atlanta, Ga., instead of the present two-unit fare of 13 cents is being considered by the Georgia Public Service Commission. Attorney Charles M. Hutchinson, representing the petitioners, stated that the present fare of 7 cents from Atlanta to Buckhead and of 6 cents from Buckhead to Oglethorpe was exorbitant, discriminatory and out of line with prices charged on other systems. Preston S. Arkwright, president of the Georgia Power Company, appeared in opposition to the petition.

Recent Bus Developments

Rules in Favor of Indiana Buses

Interurban buses in Terre Haute, Ind., now may take on and discharge passengers on any street traversed by a railway despite the city ordinance against the practice. The judge in Superior Court recently granted a restraining order to that effect on application of Joseph H. Gregg and Andrew Carl, owners of the Blue & Gray Bus Line and the Hoosier Transportation Company. The Mayor and chief of police are especially directed not to enforce the city ordinance. This will, until further order of the court, stop arrests of bus drivers for picking up and discharging passengers along railway lines. Legality of the ordinance has been questioned in a petition filed with the Indiana Public Service Commission.

In this instance, both the car lines and the buses are being operated under certificates of convenience and necessity issued by the Indiana Public Service Commission. The avenues by which the buses reach the heart of the business district in Terre Haute and which are the nearest routes to this point are traversed by car lines. A similar situation prevails in several other Indiana cities. The order issued by the court is a temporary one, but will hold good until a final order on the petition for permanent injunction is issued. The court named no date for a further hearing of the case.

Line in Missouri Continued

The United Railways, St. Louis, Mo., has been granted a certificate of convenience and necessity for the continued operation of its bus line between Wellston and St. Charles, Mo., via Federal Highway No. 40. A permit was issued by the Missouri Public Service Commission, which now has jurisdiction over Missouri bus lines.

Roberto's Bus License Revoked in Boston

The bus license of Alphonso Roberto, owner of a bus line which operates between Revere and East Boston, has been revoked by the Massachusetts Department of Public Utilities because of violation of the terms. The commission finds that on Nov. 18, 1926, and on May 23 to 28 inclusive of this year Roberto on 49 instances took on a total of 210 passengers for hire at points where, under the terms of his license, he was not authorized to stop for that purpose. The commission also finds that he discharged passengers in violation of terms of his certificate.

This is the case which attracted considerable attention when it was given a public hearing, Roberto contending that despite the state rules and regula-

tions a person has a constitutional right to get on and off a public bus wherever he pleases, and especially that he cannot be held prisoner in a bus when he desires to get out.

The restrictions had been placed in the certificate in conformity with the policy of protecting the electric railway, in this case the Boston Elevated, against unfair competition. This is the first time that the Public Utilities Department has revoked a bus license.

Buses on Old Jersey Car Route

The City Commission of Millville, N. J., has granted permission to the successor of the Millville Traction Company, Millville, N. J., to substitute buses for trolley cars on the Millville-Vineland route. The permit to operate buses extends to Dec. 31, 1930.

Bus Expansion in Lakewood

A hearing was held before the Public Service Commission on Sept. 22 on the petition of the Jamestown Street Railway, Jamestown, N. Y., to abandon its Lakewood railway line for buses operated by the Jamestown Motor Bus Transportation Company, its subsidiary. No opposition to the change was expressed, and it is expected that the commission will authorize the change.

The city's attorney, Ernest Cawcroft, declared that there was no objection on the part of the city provided there was assurance that the new service would be adequate to handle the traffic now handled by the railway. George L. Maltby, general manager, testified that an expenditure of \$8,000 to \$10,000 would be necessary to put the railway in good shape.

Buses on Utah Line

The Utah Light & Traction Company has been authorized by the Public Utilities Commission of Utah to discontinue service on its Murray-Midvale-Sandy line from the intersection in Murray of Second Avenue with State Street and to tear up its tracks on the line south of that intersection. As a substitute for street-car service on this line the company is to operate buses with the same frequency and at the same rates offered by its present railway service. Approximately 6 miles of street car track will be abandoned and superseded by bus service. This is the southern section of a line of about 14 miles which runs from Salt Lake City south to Murray, a community about 7 miles south of Salt Lake City, and thence south to the communities of Midvale and Sandy.

At the hearing the railway introduced evidence to the effect that the section of line which it seeks to abandon has been operated at a loss for several years.

Review of New Jersey Fares Refused

Chief Justice Gummere of New Jersey has denied an application by three municipalities and individuals in those municipalities for a writ of certiorari to review the decision of the Board of Public Utilities Commissioners readjusting bus and railway fare zones on the lines of the Public Service Transportation Company and the Public Service Railway.

However, the Chief Justice announced that, because of the importance of the case, he would permit the applicants to renew their plea before the Supreme Court *en banc* in Trenton in October if they wished.

The municipalities joining in the effort to have the decision reviewed were Irvington, Roselle Park, and Kenilworth.

At the offset, Chief Justice Gummere indicated that he could not see what standing the municipalities, as such, had in the case, holding that municipalities were created as governing bodies and that the case at point was not a governmental function. In the cases of the individuals joining in the application for the writ, he considered their interest small. He said:

Nothing has been shown to me, the Chief Justice said, in ruling upon conclusion of argument by counsel for the municipalities, that the Public Utilities Commission, by its act, has authorized the Public Service to charge excessive rates. It hasn't been suggested that the rates are excessive.

In arguing for the writ, Mr. Stewart said the application for the review was based upon the fact that no evidence of valuation of the property used and useful in the service by the buses had been submitted to the board or found by it.

Coach Application Opposed by New York Companies

The Equitable Coach Company, to which the Board of Estimate recently awarded a bus franchise for Manhattan, Brooklyn and Queens, has been directed by Transit Commissioner Leon G. Godley to amend its application for a certificate of convenience and necessity by filing a plan for financing. The contention that the petition on which the hearing was held was defective because it did not contain such a plan had been made by Clarence J. Shearn, counsel for the Brooklyn-Manhattan Transit Corporation and subsidiary surface line companies. Godfrey Goldmark, counsel for the Equitable company, immediately filed an amended petition, which he had held in reserve.

The amended petition proposed as a method of financing the issuance of \$4,000,000 of 6 per cent first mortgage bonds, \$6,500,000 of 5½ per cent equipment trust certificate notes, 75,000 shares of preferred stock without par value but entitled to a dividend of \$7 a share and 225,000 shares of common stock of no-par value. All of these securities are to be issued when designated by the commission, and the

entire financial plan is contingent on the commission's granting a certificate for all the routes specified in the franchise.

Mr. Shearn declared that millions of Brooklyn passengers yearly would be inconvenienced, because the Brooklyn surface lines would be affected severely if the application were granted and the Equitable company permitted to operate buses.

Mr. Shearn said that the Brooklyn surface lines carried 530,000,000 passengers each year. William Wallack, representing the New York Railways, declared that it was the duty of the commission to protect the surface lines as existing transit facilities, not through favoritism, but in the public interest.

The Union Bus Corporation objected to the granting of the certificates on two grounds. The first of these was that no statutory public hearing, as required by law, was held by the Board of Estimate before granting the Equitable company a franchise. The second was that the city had sustained a loss of \$100,000 by awarding the franchise to the Equitable company, as the Union Bus Corporation offered the city a guaranteed minimum return of \$500,000, as compared with \$400,000 offered by the Equitable company.

Legal Point Raised Over Brockton Fair Bus Permit

A temporary bus line service to the Brockton Fair is being arranged by the Eastern Massachusetts Street Railway, Boston, Mass., under a license from the Brockton city authorities. An interesting point of law has arisen in this connection. Licenses issued by the city authorities are not revokable by the city, under Massachusetts law, and some opposition to confirmation is developing before the Public Utilities Department on the ground that it might mean that the railway could operate this line to the Brockton Fair grounds every year. The question has been assigned for a public hearing.

"Busmen, Don't Be Road Hogs"

In a letter to all officers, inspectors, chauffeurs and other employees of the County Transportation Company, the bulk of the stock of which is owned by the New York & Stamford Railway, and which operates a network of bus lines in Connecticut and the Long Island Sound section of Westchester, Leverett S. Miller, president, has laid down a code of courtesy.

In this code or pronouncement there is no place for "road hogs." Mr. Miller suggests practicing the rule of judgment tempered by recognition of the rights of others. He says that by encouraging the practice of common courtesy among drivers, public and private, the number of highway casualties in Westchester will be lessened and the lamentable condition existing in that section as elsewhere will be improved.

Financial and Corporate

Gary Railways to Issue \$363,000 Common Stock

Authority to issue a total of \$363,000, par value, of common stock was granted on Sept. 19 to the Gary Railways in an Indiana Public Service Commission order. The purpose of the new issue, as alleged in the company's petition, is to reimburse the treasury for money used in purchasing the common stock of the Shore Line Motor Coach Company, a supplementary motor coach system jointly controlled by the Gary Railways and the Chicago, South Shore & South Bend Railroad.

Massachusetts Railway in Plight

The Shelburne Falls & Colrain Street Railway, operating between Shelburne Falls and Colrain, in Massachusetts, the revenues of which have been greatly enhanced by freight transportation from the Griswoldville Manufacturing Company, has been notified by the latter that it will transport all its freight by means of motor trucks after Nov. 1. It is thought unlikely that the road will be able to continue after the loss of this substantial revenue. This line is 7 miles long. It was built 31 years ago and gives the industries in that section their only connection with railroad facilities by means of a cement bridge across the Deerfield River to connect with the Boston & Maine line.

Montreal Company Given Time Extension on Property Disposal

The City Council of Montreal, Canada, has adopted the report of the city executives favoring the extension of time to the Montreal Tramways to sell certain properties it possesses in several city wards. Delay in disposing of them was due to the state of the real estate market which has necessitated this further extension of two years to January, 1930. The contract with the city provided for disposal of land in various wards within five years.

Preferred Stock Offering in Richmond

An issue of \$1,965,600 of 6 per cent cumulative preferred stock of the Virginia Electric & Power Company, Richmond, Va., was offered Sept. 19 at \$97.50 a share and a yield of 6.15 per cent. The par value of the stock is \$100 a share. The stock was issued to provide for extensions and improvements of equipment throughout the area served by the company in Virginia and North Carolina.

Employees of the Virginia Electric & Power Company were given an opportunity to purchase the stock before

it was placed on general sale. On the partial payment plan an initial payment of \$7.50 was made on each share and the balance in nine months at \$10 each. In Richmond, 2,000 more employees bought 400 more shares of the latest issue than they purchased of the issue of \$1,500,000 brought out in December of last year.

Decrease in Boston Traffic in July

The cost of service of the Boston Elevated Railway, Boston, Mass., exceeded the revenue in July, 1927, by \$353,208, against \$393,028 in July, 1926. The number of revenue passengers carried was 26,167,466, compared with 27,160,300 for July, 1926. Total miles operated numbered 4,491,667, against 4,809,609 in July, 1926. These figures included bus-miles of 465,875 in July 1927 and 417,165 in July 1926.

President Baker Defends Fitchburg & Leominster Road

Charles S. Cummings, Boston, has filed a bill in equity in the Superior Court in Boston asking that a receiver be appointed for the Fitchburg & Leominster Street Railway or that the Boston Safe Deposit & Trust Company, trustee under the mortgage indenture, be ordered to take possession of the road for the bondholders. Mr. Cummings, as the owner of \$5,000 of bonds of the company, declares the company has defaulted on interest payments and that it owes various banks \$710,800 in unsecured notes. He wants the road enjoined from paying any more interest on the unsecured notes until the bondholders are paid in full.

Mr. Cummings alleges that the \$300,000 of bonds, due on Feb. 1, 1921, were extended for five years at 7 per cent; that up to 1926 on this five-year extension the railway paid interest on the bonds and also paid \$25,700 on secured debts and \$231,686 on unsecured debts, a grand total of \$315,886, or a sum more than sufficient to pay the bonds in full.

In 1926 the plan was adopted through action of a bondholders' and note holders' committee to extend these bonds another five years at a lower rate of interest. A new plan was made for handling the unsecured notes by which the note-holders would have their notes maturing each year. Under this plan no provision was made to establish a fund to pay off the bonds, it was claimed. Mr. Cummings charges that in the last eighteen months, holders of unsecured notes have received \$14,216 in interest and that bondholders of the Leominster, Shirley & Ayer Street Railway have received \$6,000 in interest. He complains that the note holders will have received \$106,620 and that the holders

of the bonds of the Leominster, Shirley & Ayer Street Railway will have received \$20,000 in interest to the damage of the Fitchburg & Leominster bondholders.

PRESIDENT DEFENDS ACTION

When he was informed about the bill in equity Emerson W. Baker, president of the railway, said that the company's property is perfectly protected by the so-called "after acquired" clauses in the trust mortgage. He said:

All that Mr. Cummings wants, apparently, is to get paid par value for his bonds right now and to let the best wait until the end of the reorganization period. Our hope and endeavor is to improve the property and so improve the condition of the bonds. It is now far better than when we took hold of it on Oct. 21, 1926.

Mr. Cummings is in error when he alleges the property is no better off than it was before. The rolling stock and other equipment are far better than ever before. The amusement park has been rebuilt, much work has been done on tracks and three rotary converters have been installed. Take, for instance, the bus terminal. It has been repaired and a heating plant put in.

As a matter of fact, the bonds are hard to get. Those who hold them now seem to be well satisfied with the progress made and are very reluctant to part with them.

The remark by Mr. Cummings about interest is misleading. All he would have to do to get the interest on his bonds would be to present them at the Boston Safe Deposit & Trust Company. It has awaited since 1926 at 5 per cent. This is one-half per cent more than the rate originally issued. His declaration of 7 per cent I cannot understand, inasmuch as that rate operated from 1921 to 1926 and ended then.

Mr. Cummings' prayer relating to payment of sums to unsecured creditors I would answer by saying we have not paid out anything since Feb. 1, 1927, and are not planning to pay anything now. I do not see how anything would be gained by a trustee or receivership. We are operating at a profit so far as revenue and expenses are concerned. For the six months ended July, 1926, there was a loss of \$20,000, but for the six months ended July, 1927, we made \$26,000, a change of about \$46,000 for the better.

This does not mean that the company is prosperous. It merely means we are operating at a profit and expect to pay out of our current income for all new equipment over a period of years. We do not expect ever to pay more than a small percentage by way of compromise with the noteholders and very old unsecured creditors. In other words, the capital structure ultimately will have to be greatly reduced, but this has no present effect on the quality of service rendered.

COURT DISALLOWS CONTENTION

The Charles S. Cummings bill, heard in equity session recently at Boston, Mass., was denied by Judge Marcus Morton on the grounds that there was no dispute as to facts in the case and that whatever question in law might be raised it would not justify the court in issuing an injunction to prevent payment of interest. Such a move would it was brought out, prevent the proper and successful negotiation of plans for the betterments of the company to the general advantage of the public.

Deficit in Indianapolis in 1926

The net earnings of the Indianapolis Street Railway, Indianapolis, Ind., for the year ended Dec. 31, 1926, less taxes, were \$880,575, against \$1,116,924 for the year previous. After all deductions there was a deficit of \$203,514. This compares with a balance in 1925, after all deductions, of \$41,175.

An extensive improvement program was carried out by the company. This included track and paving work, the installation of temporary cross-overs, replacements, renewals and the relocations of loop track. Five new substations are now well under way. Power is to be supplied by the Indiana Electric Corporation, at a material reduction, and the operation of cars greatly improved.

The company is at present operating 33 buses, fifteen of which are used on nine feeder lines. The service, while greatly accommodating the public and protecting the company from further inroads of competing bus lines, has lacked patronage and resulted in a net loss from operation, including depreciation, of \$203,507 for the year 1926. In addition to the general news on the

INCOME ACCOUNT OF THE INDIANAPOLIS STREET RAILWAY

For Year Ended Dec. 31, 1926

Gross Earnings:	
Passenger receipts—city lines.....	\$4,425,529
Transfer receipts—city lines.....	310,866
Track rentals interurban passenger cars..	105,994
Track rentals interurban freight cars....	53,238
Chartered cars.....	736
Advertising.....	30,600
Dog permits.....	1,151
Rent of land and buildings miscellaneous.	27,417
Rent of terminal building and stations....	247,467
Sale of power.....	6,126
Rent of equipment.....	1,315
Miscellaneous income.....	2
Receipts, Broad Ripple Line.....	86,689
Bus receipts.....	214,703
Interest, discount.....	6,954
Total.....	\$5,518,794

Operating Expenses:	
Maintenance of way and structures.....	\$610,914
Maintenance of equipment.....	502,982
Special maintenance per order of Public Service Commission of Indiana.....	
Operation of power plant.....	756,813
Operation of cars and buses.....	2,028,500
General expenses.....	444,135
Total.....	\$4,343,346

Net earnings.....	\$1,175,447
Less taxes.....	294,872
Total net earnings, less taxes.....	\$880,575

Deductions:—Bond Interest	
Interest on \$4,000,000 Citizens Street Railroad 5's.....	\$200,000
Interest on \$4,547,000 Indianapolis Street Railway 4's.....	183,484
Interest on \$3,570,000 Indianapolis Traction & Terminal Company's 5's.....	178,663
Interest on \$285,000 Broad Ripple Traction Company's 5's.....	12,361
Interest on trust equipment notes.....	2,684
Interest on Indianapolis car equipment company preferred stock.....	4,250
Interest on notes.....	49,497
Total deductions.....	\$630,939

Surplus (exclusive of accrued depreciation).....	\$249,635
Deductions from surplus:	
Indianapolis Street Railway sinking fund.	\$80,000
Indianapolis Traction & Terminal Company sinking fund.....	73,150
Dividends unpaid on \$5,000,000 preferred stock 1926.....	300,000
Total deductions.....	\$453,150
Balance (deficit).....	\$203,514

COMPARATIVE OPERATING STATEMENT OF THE INDIANAPOLIS STREET RAILWAY

	1926	1925
Earnings:		
Passenger receipts—City lines.....	\$4,425,529	\$4,754,227
Transfer receipts—City lines.....	310,866	176,492
Miscellaneous earnings—		
Track rentals.....	782,398	605,649
Gross earnings.....	\$5,518,794	\$5,536,369
Maintenance of way and structures.....		
Maintenance of equipment.....	\$610,914	\$631,678
Special maintenance expended from revenue from increased fares by order of Public Service Commission.....	502,982	517,988
		20,788
Total maintenance.....	\$1,113,896	\$1,170,375
Operation of power plant.....	\$756,813	\$734,466
Operation of cars.....	2,028,500	1,682,517
General expenses.....	444,135	445,462
Total operation expenses.....	\$4,343,346	\$4,032,821
Net earnings.....	\$1,175,447	\$1,503,548
Less taxes.....	294,872	386,624
Net earnings, less taxes.....	\$880,575	\$1,116,924

company's bus activities the report refers to the proposed merger of the Peoples Motor Coach Company and the Indianapolis Street Railway.

During the past year the company purchased 370 Johnson registering fare boxes and 1,000,000 tokens at an expense of \$31,105. The token system was started on Jan. 1, 1927. By this the company hopes to eliminate the expense of printing tickets and other expenses in the counting room. Beside 59 one-man cars are now in operation in Indianapolis, resulting in a saving in operating cost. More cars are to be converted into the one-man operating type during the year 1927.

The board of directors was unable, according to the report, to declare dividends on the Indianapolis Street Railway preferred stock during the year 1926 on account of decreased earnings, due principally to the constantly increasing use of privately owned automobiles and to serious loss from bus competition.

During the year 1926 there was paid to employees and beneficiaries of the Pension Fund and Benefit Association \$29,000, of which sum the company contributed \$5,000. These two associations since their organization have disbursed nearly \$200,000 as subsidies for the sick and surviving members of families of deceased members.

Railway Net of Northern States Power Shows Improvement

The gross earnings of the street railway department of the Northern States Power Company for the year ended Dec 31, 1926, were \$268,704, representing 0.95 per cent of the total gross. In 1925 the gross earnings were \$277,578. Net earnings in 1926 showed a loss of \$30,654 against a loss of \$61,858 for the year previous. This company, controlled by the Northern States Power Company of Delaware, a Byllesby property operates 16 miles of line connecting Fargo, N. D., and Moorhead and Dilworth, Minn.

Evanston Railway Asks Authority for Refunding Issue

Application for authority to issue \$15,000, par value, of general mortgage bonds was made to the Illinois Commerce Commission on Sept. 14 by the Evanston Railway, Evanston, Ill. The company's petition states that the new bonds are to be issued in lieu of first mortgage bonds in the amount of \$15,000 recently paid and canceled.

Fight Over Goshen, Ind., Discontinuance

A recent ruling by Judge Thomas Pick in the federal court at South Bend, Ind., granted permission to R. R. Smith, receiver of the Chicago, South Bend & Northern Indiana Railway, to discontinue service in Goshen. The receiver cited the constant decrease in revenue in Goshen for several years as the reason for the discontinuance. The City Council, however, will oppose the court ruling because of a finding clause in the franchise. The legality of the franchise likely will come before the courts.

Partial Discontinuance in Syracuse Allowed

The Public Service Commission granted on Sept. 23 the petition of The New York State Railways for permission to discontinue service on its Green Street line in Syracuse. It was established at the hearing that the line was operated at a loss and that there were other means of public transportation available to the patrons. Commissioner Brewster in his memorandum accompanying the order said that the loss to the petitioner through this operation exceeded its income therefrom by more than 50 per cent and further that no real public necessity demanded the continuance of service.

A. G. & E. Properties Under New Owners

The American Electric Power Corporation, of Delaware, which now owns the voting stock of the Pennsylvania Gas & Electric Corporation, has purchased the American Gas & Electric Company's controlling interest in the stock of American Electric Power Company, which owns control of utility properties in and near Wilmington, Del., and Springfield and Dayton, Ohio. The purchase of this holding company stock in no way anticipates any change in the local management of the subsidiary properties except that they will come under the general management and supervision of Stevens & Wood, Inc., New York, a corporation that for many years has operated extensive public utility properties in Ohio, Pennsylvania, New York, Virginia, District of Columbia and North and South Carolina. Transportation service will be furnished to and about Wilmington, Del., and Media and Chester, Pa., and to

Springfield and Dayton, Ohio, by the Peoples Railway of Dayton, Ohio, the Wilmington & Philadelphia Traction Company, Wilmington, Del., and the Springfield Railway, Springfield, Ohio.

Eight Months Net of Eastern Massachusetts \$546,377

Net income of the Eastern Massachusetts Street Railway, Boston, Mass., after all charges for the month of August, was \$42,409, compared with \$38,433 a year ago. Gross operating revenues for the month were \$744,925, against \$757,134, and income after taxes was \$223,167, compared with \$222,656. For the eight months period ended August, 1927, the net income after all charges was \$546,377, compared with \$530,067. Gross operating revenues for this period were \$6,326,620, against \$6,373,659, and income after taxes was \$2,309,846, compared with \$2,316,886.

Balance Higher in Reading

For the year ended July 31, 1927, the operating revenue of the Reading Transit Company and subsidiary companies, Reading, Pa., was \$2,935,181, against \$2,981,253 for the period ended July 31, 1926. Operating expenses and taxes, excluding depreciation and maintenance, decreased from \$1,715,145 to \$1,619,880 for the 1927 period. Total deductions from income left a net income of \$210,073 in 1927 and \$159,560 in 1926. After the provision for dividend on preferred stock the balance of net income was \$90,928 against \$40,415 for the year ended July 31, 1926.

Kaw Valley Sale Confirmed

The sale of the Kansas City, Kaw Valley, & Western Railway, Kansas City, Mo., was confirmed on Sept. 14 by Judge John C. Pollock of the federal court in Denver. The sale was made to a group headed by Jo Zach Miller, Jr., 1001 Commerce Building, Kansas City, and George W. York, Cleveland. The sale price was \$300,000. Mr. Miller is president and Mr. York vice-president of the new company. The line has been in receivership several years. It operates between Kansas City and Lawrence, Kan.

Second Avenue Railroad, New York, Sold

On behalf of the preferred certificate holders' committee Arthur W. Hutchins has bought for \$500,000 all the tangible assets of the Second Avenue Railroad, New York. The sale was made at public auction conducted by Joseph P. Day, who announced that the sale was subject to the confirmation of the Supreme Court. The assets comprise the real estate, franchises, trackage, agreements and contracts. The real estate included the entire block on First and Second Avenues between 96th and 97th Streets.

An action started on behalf of George E. Warren and others against the Second Avenue Railroad brought about the sale, which was directed by a judgment of the Supreme Court of New York County and under the direction of John C. Clarke, referee.

The assets were purchased provisionally and subject to the confirmation of the Transit Commission's acceptance of the reorganization plan adopted by the certificate holders' committee.

Improvement in Revenue from Omaha Property

The report of the Omaha & Council Bluffs Street Railway, Omaha, Neb., for the month of August, filed with the Nebraska Railway Commission, continues to show a steady decrease in traffic exceeding 3 per cent, compared with the month of August, 1926, but the financial results of operation are better. Revenue for the month was \$216,093, a decrease of \$9,000 over August, 1926, but operating costs were cut \$14,000, to \$166,173. The net after payment of taxes was \$26,744, and as interest charges are \$37,479 a month, the deficit was \$11,412, compared with \$20,611 for August a year ago.

Attractive Railway Securities Await the Knowing Investor

The fact that progressiveness is permeating most of the electric railway industry and that in view of this condition opportunities abound among its securities was emphasized by Clarence V. Price, of Price and Company, in an article in a recent issue of the *Financial World*. As proof of this spirit of progress he cites arguments such as trained men, light-weight and one-man cars, weekly tickets, bargain rides and many other features of modern merchandising methods whereby service is really sold to prospective riders. In addition he refers to the changed attitude on the part of the railway managements who now take the public into their confidence, seeking their opinions and reactions as well as catering to their conveniences and comforts. Such conditions convince Mr. Price that many investors are overlooking some unusual bargains in the electric railway security field. He says that these have a real promise for the future. "Too many investors, perhaps," he says, "still are looking on the local transportation industry with 1915 eyes. The best advice that I could give them is to familiarize themselves with current conditions."

Discontinuance Sought in Hillsboro

John H. Mitchell, manager of the Illinois Power & Light Corporation, has applied to the Illinois Commerce Commission for authority to discontinue the two railway routes operating in Hillsboro, Ill.

Legal Notes

FEDERAL CIRCUIT COURT—*Law prohibiting competing buses on certain streets is valid.*

An Oklahoma statute and a city ordinance which prohibited the operation of buses on streets occupied by street railway lines or on the first two streets on either side of a street so occupied and, parallel to it, was held not to be discriminatory and invalid because they excluded from such prohibition motor buses operated by the street railway company as part of its transportation system. The court said that competition, like monopoly, may be restrained for the public welfare; the test in each instance is the public good. [People's Transit Co. vs. Henshaw, S.L. 20 Fed. (2D), 87.]

FEDERAL DISTRICT COURT—*Rulings on Valuation of Public Utility Property.*

In an extended decision, the District Court for the District of Idaho, ruled on methods of valuing real estate used in public utility service and on allowances for overhead, contingencies, contractors fees, good will, working capital, depreciation, reasonable return and other features in connection with valuation and rate making. [Idaho Power Co. vs. Thompson et al., 19 Fed. (2d), 547.]

KENTUCKY—*Street Railways May Sue to Restrain Operation of Illegal Bus Lines.*

A street railway company, as a taxpayer, can maintain a suit to restrain the operation of a competing bus line over city streets, where the competing line has no franchise. The fact that the railway company itself may be operating bus lines on some streets without a specific franchise does not prevent it from bringing suit to enjoin the operation of a competing bus line. [People's Transit Co. vs. Louisville Railway, 295 S. W., 1055.]

MASSACHUSETTS—*Only Duty of Railway on Reservation Is to Refrain from Wanton or Reckless Conduct.*

A railway company had laid tracks on a reservation in the center of a street, and a person intending to become a passenger, while crossing the reservation diagonally at a place where there was no cross walk was struck by a car. It was held that the railway owed him no duty except to refrain from wanton or reckless conduct. [Fernald vs. Boston E.R., 156 N. E., 692.]

MASSACHUSETTS—*Failure to Register Makes an Auto Trespasser.*

In an action for damage to an auto resulting from a collision with a street car of the defendant, under circumstances warranting a finding of due care on the part of the plaintiff and negligence on the part of the de-

fendant, it appeared on the day before the accident the plaintiff removed from his auto the motor, listed on his certificate of registration and installed a new motor therein, but obtained no new registration since the installation. It was held that the plaintiff was a trespasser on the highway and could not recover for damages to his auto through the negligence of another. [Wallace vs. No. Bedford & Onset St. Ry., 155 N. E., 660.]

MASSACHUSETTS—*Passenger on Truck Is Guilty of Contributory Negligence.*

An experienced truck driver who was riding in another truck as a guest was injured while the truck was running on the wrong side of the road and was struck by an electric car. Both the driver of the truck and his guest were held to be guilty of contributory negligence. [Thorpe vs. Boston E.R., 156 N. E., 748.]

MASSACHUSETTS—*Driver Trying to Start Stalled Car on Track Without Looking for Approaching Street Car Held Negligent.*

An automobile became stalled on a straight railway track and the driver started to crank it without looking to see whether any cars were coming. The railway was not responsible when he was struck. [Loyle vs. Boston Elevated Railway, 157 N. E., 356.]

MISSOURI—*Refusal of instructions on sounding gong upheld.*

An action was brought under the humanitarian doctrine for personal injury when a street car hit an automobile which was being driven on the left side of the street and in a rut in the car tracks. The plaintiff claimed that if the car gong had been sounded the driver would have had warning, but the request of the company that the court instruct the jury there was no evidence that such failure to use the gong was the approximate cause of the collision was refused. This refusal was upheld by the Supreme Court. [Perry vs. Fleming et al., 296 S. W., 167.]

MISSOURI—*Wording of Ordinance for Punishing Transfer Abuse Is Important.*

An ordinance passed by the City, making it unlawful for any person not connected with the railway company to sell, barter, or exchange for any consideration a street railway transfer, or give it away for the purpose of enabling another person to use it for passage, or any person so to use it, or to alter the transfer so that it could be used for a round trip, to be guilty of a misdemeanor. The Court held that the wording of this ordinance attempted to regulate the rates and practices of the company which the city had no power

to do. The Court pointed out, however, that an ordinance prohibiting the use or issue of transfers in violation of the rules and regulations of the street car company, would be valid, as these rules presumably would have the sanction of the State Public Service Commission. [Ex Parte Packman, 296 S.W., 366.]

MONTANA—*For Taxation, Electric Railway Track and Poles May Be Considered Personal Property.*

For the purpose of taxation, the State of Montana classified property into seven groups of which one includes real estate and improvements and one personal property. The rates were different on these two. By an amendment of the act, a street railway track was placed in the "personal property" group. The present case was upon the proper grouping of the overhead construction and poles which, for reasons given in the decision, were also placed in the "personal property" group. [Butte Electric Railway vs. Brett, 257 P., 478.]

NEW JERSEY—*License Required by Bus Hauling Employees of Single Industrial Plants.*

A bus hauled only employees of a single industrial plant to and from it and made no stops to receive or discharge passengers in a town where it had no municipal license. This was held to be a violation of a statute which requires motor buses to receive municipal licenses from the municipalities through which they operate and have such licenses approved by the Board of Public Utility Commissioners. [Daskovich vs. Board of Public Utility Commissioners, et al., 138 At., 110.]

OHIO—*Judicial Notice Will Be Taken of Differences Between Buses.*

A bus company operated some 16-passenger buses under authority of the Public Utilities Commission, but the State Supreme Court issued an order at the request of a railway company that the bus company must use 7-passenger buses instead of those employed. The bus company then removed 9 seats in each of the 16-passenger buses, but the Court held that this was not in compliance with its order. [Scioto Valley R. T. Co. vs. Public Utilities Commission, 157 N. E., 475.]

WASHINGTON—*Passenger Alighting in Dangerous Place Must Exercise Special Care.*

At a point where an accident occurred there was a single track in the middle of a street and only on one side of this track the street was paved. On this paved side, traffic moved in both directions. A passenger was injured after alighting from a car by being hit by an automobile travelling in the opposite direction from the car. The passenger had an unobstructed view and as good an opportunity to see possible danger as the car operator. The decision of the jury in favor of the railway was upheld. [Jones vs. City of Seattle, et al., 157 P. 393.]

Personal Items

Cincinnati Men in New Posts

Added Responsibility for Engineers Under New Power Arrangement — Careers of Men Involved, Messrs. Venning, Clark, Swift, Noertker and Genrich, Are Reviewed

FURTHER details available about the promotions in the personnel of the Cincinnati Street Railway, Cincinnati, Ohio, and the assignment of additional duties to officers of the operating department of the railway indicate more minutely than a previous item the significance of the changes. To provide for the new power distribution plans under which the railway will get all its power from the Union Gas & Electric Company through a system of eighteen automatic substations, the responsibili-

operating company in Cincinnati, the Cincinnati Street Railway.

W. P. Clark was appointed assistant superintendent of track and roadway. He will assist the superintendent in handling the large program of track reconstruction work which is being carried on by the company. Mr. Clark had also served the traction company prior to the reorganization in 1925. After his graduation from Tri-State College at Angola, Ind., as civil engineer in 1921, he went to the company as material



F. J. Venning



H. L. Swift



W. P. Clark

ties of Messrs. Venning, Clark, Swift, Noertker and Genrich are increased.

F. J. Venning will continue as superintendent of power and will have jurisdiction over the Perdleton power house and all operations incident to the production of power. He will have charge of the transmission lines to the point where current is delivered to the switches in the substations and all feeder lines from the time they leave the substations, as well as the overhead trolley lines. He will also supervise the maintenance and operation of the Mount Adams Incline. Mr. Venning began as a boiler for the Westinghouse Electric Company in 1889. He entered the street railway field in 1893 as barn foreman for the Citizens Traction Company of Pittsburgh, where he later became superintendent of maintenance of way and overhead lines. He remained in Pittsburgh until January, 1910, when he was appointed superintendent of construction for the Cincinnati Traction Company. He was made superintendent of overhead lines for this company in June, 1918, and in 1920 was given additional jurisdiction over shops and equipment. In February, 1926, he was made superintendent of power for the new

man. In 1924 he was made paving engineer.

Harley L. Swift was appointed superintendent of substations and will have jurisdiction over the maintenance of all present substations and the construction of the new substations, including the installation of the equipment. He went to the Cincinnati Street Railway in January, 1927, as assistant superintendent of maintenance of way, leaving his position as superintendent of factory No. 14 of the American Window Glass Company at Monongahela, Pa. He is a graduate of Penn State College, where he received his degree in 1914 as mechanical engineer.

J. A. Noertker was appointed electrical engineer and will look after the details of the new substation installation. He entered the company's employ in 1921 as draftsman after his graduation from the University of Cincinnati as electrical engineer.

H. C. Genrich was appointed electrician and will continue to handle the inspection and maintenance of the present substation and to assist in constructing the new stations. He has been with the company since 1895 and has served as chief electrician since 1898.

L. S. Ready Takes Up Commissioner's Duties

Lester S. Ready, vice-chairman of the board of directors of the Key System Transit Company, Oakland, Cal., and formerly president of that company, has completely severed his connection with that utility. The California Railroad Commission, of which he was formerly chief engineer, has announced that arrangements have been concluded with Mr. Ready to take charge of the preparation and presentation of the commission's testimony and evidence in the pending Pacific Telephone & Telegraph rate case.

Mr. Ready is a graduate of the University of California, College of Electrical and Mechanical Engineering, class of 1912. For four years he was chief engineer of the commission and was connected with the engineering department of the commission for thirteen years. He has had charge of the various engineering investigations in connection with all the varied rate proceedings before the commission in recent years.

Daniel Durie Made General Manager of West Penn Lines

H. L. Mitchell, president of the West Penn Railways, Pittsburgh, Pa., on Sept. 27 announced changes in the operating organization of the company. Two operating divisions have been created and a general manager has been named for each of the two sections of the system. Daniel Durie, Connellsville, Pa., who has been general superintendent of what is known as Territory "A," is promoted to the general managership of the Pennsylvania Division. The West Virginia and Ohio Division is under the direction of A. C. Spurr, Wheeling, W. Va.

Three co-operating departments are included in the railway's organization, all located at Pittsburgh. J. L. Fritsch, chief engineer of the company since its beginning, has charge of engineering and construction standards. James McFall, general claim agent of the West Penn Railways and the West Penn Power Company, is in charge of the claims department. H. K. Breckenridge, Pittsburgh, development engineer, is in charge of bus developments and standards.

H. S. Metcalfe, who has been in charge of public relations, has been appointed assistant to Walter S. Finlay, Jr., president of the West Penn Electric Company, in the publicity and public relations field, but he will continue to serve the railways department as his services are needed.

J. O. Horton, who has been in the Pittsburgh office, is transferred to Connellsville and appointed assistant to Daniel Durie, general manager. Ernest R. Kooser, Connellsville, assistant superintendent of Territory "A," becomes superintendent of transportation in that division, and Joseph Black, located at New Kensington, is named superintendent of transportation in Territory "B."

Manufactures and the Markets

100 Articulated and One-Man Units for Cleveland

Shortly after the Cleveland convention an order will be placed by the Cleveland Railway for 100 street cars part of which are to be the duplex articulated type and the rest for one-man, two-man, front-entrance, center-exit operation. Samples of each type are under construction and will be exhibited at the convention. Authorization for the purchase was made about two months ago by the City Council of Cleveland, according to Joseph H. Alexander, president of the traction company. The order is in addition to the 36 single-deck buses, ten de luxe single-deck buses and six double-deck units which were purchased from the White Motor Company, Yellow Coach Company, and Six-Wheel Company respectively.

Rolling Stock Order Placed by German State Railways

In connection with the electrification of the railways in Silesia and Saxony, the German State Railway Company has lately placed orders for more than 80 electric locomotives and other rolling stock to an estimated value of \$850,000. Brown, Boveri & Company, Mannheim, in conjunction with the Krauss Locomotive Works, Munich, are to supply seven 2,200-hp. express locomotives and the A.E.G. and the Siemens-Schuckert Company, Berlin, in conjunction with the Borsig Company of Tegel, 33 2,600-hp. engines. The A.E.G. and the Siemens-Schuckert concerns are also to supply twelve heavy goods engines and eight shunting locomotives, while the Bergman Electric Company and the Schartzkopf Company, Berlin, are to supply five light express locomotives and 23 goods engines.

Fire Destroys 25 Trolley Cars in Canada

Fire last Sunday night destroyed a wing of the Ottawa Electric Street Railway carhouse in the Rockcliffe district and 25 trolley cars, with an estimated loss of \$200,000. An early investigation points to the blaze having originated from defective wiring. Breaking out near the front door of the building, the conflagration soon assumed uncontrollable proportions and swept through the entire wing, rapidly reducing it to ashes. Besides the 25 emergency trolley cars lost, a track bonding car and a track grinder car were destroyed. The entire loss is covered by insurance.

Two other wings of the main carhouse were saved. The structure is within a stone's throw of Rideau Hall, official residence of the Governor-General, and but for an opposite wind these buildings would have been endangered

by myriads of sparks thrown up by the blaze. Firemen had a strenuous task in keeping the flames from catching the thick bush, which stretches for miles at the rear of the carhouse and forms Rockcliffe Park, a scenic beauty spot of the capital.

Subway Approach Planned by I.T.S. for St. Louis

Illinois Traction System, Springfield, Ill., has engineers at work to devise plans for a co-ordinated subway and elevated railway system to connect its downtown terminal and station at Twelfth and Lucas Avenue, St. Louis, Mo., with a proposed new approach to the McKinley Bridge which spans the Mississippi River at Salisbury Street.

The new system would give the railway approved access to the downtown section for its freight and passenger business and eliminate many grade crossings in north St. Louis. Three tentative plans are under consideration, but the preliminary studies have not advanced sufficiently to warrant any announcement at this time. It probably will be January before anything definite will be decided.

Worcester's \$75,000 Bus Purchases Approved by Commission

The Worcester Consolidated Street Railway, Worcester, Mass., has entered into a conditional sales agreement with the Yellow Manufacturing Sales Corporation, Chicago, for the purchase of seven motor coaches, which has been approved by the Massachusetts Department of Public Utilities as being "reasonable and proper and for a lawful purpose."

The coaches are to have special bodies, manufactured by the Lang Body Company. The conditional sale calls for the payment of a sum not exceeding \$75,410, with 6 per cent interest, in installments on specified dates.

Twin Coach May Appear in New York

Contingent upon the outcome of franchise hearings before the New York Transit Commission and legal proceedings by other transportation companies concerned, the Equitable Coach Company, New York, N. Y., will operate Fageol Twin Coaches on crosstown lines in Manhattan and ordinary street-car type city buses in Brooklyn.

Should the necessary permission be secured, the company will place in service 163 Twin Coaches in Manhattan, establishing a crosstown service with a two-minute rush-hour headway. An indeterminate number of the street-car type buses will be purchased for use in Brooklyn.

Electric Locomotive Sought for South Africa

The South African Railway Administration is inviting tenders for an electric freight locomotive. The authorities desire to find an electric unit that will be a big improvement on those in use at present, and it is their intention to test this single unit against the three units now being employed. Should the experiment prove successful, it is understood that this contract for a single locomotive will be followed by one of the largest contracts in the history of the South African railways.

Delivery of Detroit Cars Will Begin in October

Delivery of the 125 Peter Witt type cars ordered on July 30 by the Department of Street Railways of the City of Detroit from the Cummings Car & Coach Company, Chicago, will begin in October. Following the first delivery eight cars will be completed each week. Payment for the cars, as outlined in the July 23 issue of *ELECTRIC RAILWAY JOURNAL*, is being made by an initial installment of \$250,000 and \$18,000 per month over a ten-year period from Aug. 1, 1927, to July 1, 1937, inclusive. The units are of the single-end type and are designed for two-man operation. Specifications for the units follow:

Number of cars ordered.....	125
Type of unit.....	Peter Witt two-man, motor, passenger, city, single end, double truck
Seating capacity.....	52
Builder of car body.....	Cummings Car & Coach Company, Chicago
Weight, total.....	36,000 lb.
Boiler centers, length.....	23 ft. 9 in.
Length over all.....	48 ft. 5 in.
Truck wheelbase.....	5 ft. 6 in.
Width over all.....	8 ft. 4 in.
Window post spacing.....	29½ in.
Body.....	Steel
Roof.....	Arch
Doors.....	Peter Witt
Air brakes.....	Westinghouse DH-16
Armature bearings.....	Plain
Car signal system.....	Faraday
Compressors.....	DH-16
Conduit.....	Flexible
Control.....	K-35 HH
Curtain fixtures.....	Curtain Supply Company
Curtain material.....	Pantasote
Destination signs.....	Hunter
Door mechanism.....	National Pneumatic
Doors.....	Front folding, center slide
Energy-saving device.....	Cleveland
Fare boxes.....	Cleveland
Finish.....	Lacquer
Floor covering.....	Wood
Gears and pinions.....	Grade M. & B. P.
Glass.....	D. S. A.
Hand brakes.....	Peacock
Hand straps.....	Rico No. 7
Heaters.....	Gold
Headlights.....	Golden Rod
Headlining.....	Three-Star Agasote
Interior trim.....	Cherry
Journal bearings.....	Plain
Journal boxes.....	Symington
Lamp fixtures.....	Electric Service Supplies Company
Motors.....	Four General Electric 265, four Westinghouse 510, inside hung
Roof material.....	Wood
Sash fixtures.....	Edwards
Seats.....	Rattan
Seat spacing.....	29½ in.
Seating material.....	Rattan
Steps.....	Stationary
Step treads.....	Kase
Trolley.....	Ohio Brass
Trolley base.....	Ohio Brass
Trolley wheels.....	Detroit Street Railway, standard
Trucks.....	Standard
Ventilators.....	Railway Utility Company
Wheels.....	26-in., steel
Wheelguards.....	H. B.

Twenty New Steel Motors and Trailers for the South Shore Line



Ten motors and ten trailers of this type for the South Shore Line

Delivery of the first of twenty new steel motor cars and trailers built by the Pullman Car & Manufacturing Company was made recently to the Chicago, South Shore & South Bend Railroad, Michigan City, Ind. The initial assignment of new equipment, which was ordered in January, consisted of five rail cars. They were received July 30. Five additional trailers were expected to arrive by Aug. 8, while the ten motor cars were scheduled to be in service shortly after. Reference to delivery appeared in the JOURNAL of July 30.

Features which distinguish the latest group of passenger cars from the 25 units put in service by the South Shore line a few years ago, coincident with the re-electrification of the road, are their greater length and the bucket type seat used. The new cars are 61 ft. long, 1 ft. longer than the old ones, and are equipped with rotating bucket seats upholstered in gray Byzantine plush, whereas green plush reversible cross seats were installed in the earlier equipment. Another interesting arrangement in the new cars is the Pullman type smoking compartment, which has been made standard for both motors and trailers. The smoking compartments are furnished with facing leather-covered seats for eight passengers. An aisle passes around this compartment, making it unnecessary for passengers entering the cars to pass through the smoke-filled room.

Control apparatus in each car permits multiple-unit operation with either a motor or trail car at the head end of the train. The cars are also equipped with steel and canvas diaphragms, making possible the operation of solid vestibule trains. Steel pilots are at both ends of the cars.

The interior finish of the cars is mahogany with cream-colored ceilings, while the exterior is done in the railroad's standard orange and maroon lacquer. A 32-volt multiple lighting system is used, with a 225-amp.-hr. storage battery automatically charged from a motor-generator set.

The motor car specifications are as follows:

Number of units.....	10
Type of unit.....	Two-man, motor, passenger, inter-urban, double end, double truck
Number of seats.....	48
Builder of car body.....	Pullman Car & Mfg. Company, Chicago, Ill.
Weights:	
Car body.....	63,700 lb.
Trucks.....	33,200 lb.
Equipment.....	33,700 lb.
Total.....	129,600 lb.
Bolster centers.....	38 ft. 0 in.
Length over all.....	61 ft. 0 in.
Length over body posts.....	49 ft. 6 1/2 in.
Truck wheelbase.....	7 ft. 0 in.
Width over all.....	10 ft. 1 1/2 in.
Height, rail to trolley base.....	13 ft. 1 in.
Date of order.....	Trucks, Dec. 18, 1926; body, April 18, 1927
Date of delivery.....	Aug. 8, 1927
Window post spacing.....	Aug. 8, 1927
Body.....	All steel
Roof.....	Arch



Interior of one of the units showing the rotating, bucket type seats

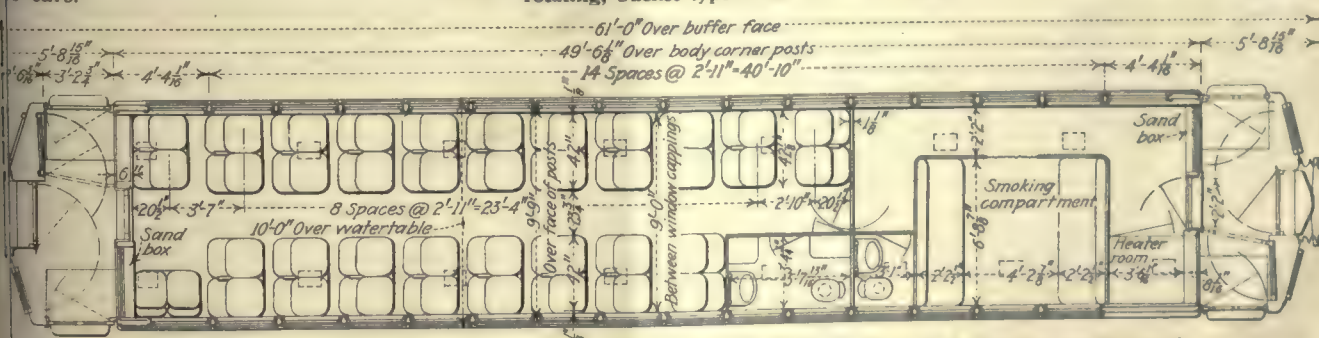
Doors.....	End, swinging
Air brakes.....	Westinghouse AMU
Armature bearings.....	Plain
Axles.....	5 1/2 x 10 in.
Car signal system.....	Faraday 32-volt, single stroke bell
Compressors.....	Westinghouse D3F, 1,500-volt
Conduit.....	Metal
Control.....	Westinghouse HBF, 1,500-volt
Couplers.....	Ohio Brass Company
Curtain fixtures.....	Railway Curtain Company
Curtain material.....	Pantasote
Destination signs.....	Hunter
Energy-saving device.....	Economy meters
Finish.....	Duo
Floor covering.....	1 1/2-in. battleship linoleum
Gears and pinions.....	Westinghouse BP
Glass.....	Plate
Hand brakes.....	Peacock staffless
Heat-insulating material.....	Balsam Wool
Heaters.....	Peter Smith, OC2
Headlights.....	Electric Service Supplies Company
	32-volt, 250-watt

Headlining.....	Steel
Interior trim.....	Mahogany
Journal bearings.....	Plain
Journal boxes.....	Symington
Lamp fixtures.....	Pullman dome type
Motors.....	Four Westinghouse No. 567, inside hung
Painting scheme.....	Orange and maroon
Pantograph.....	No. 515C Westinghouse
Roof material.....	Poplar wood and canvas
Safety car devices.....	"Deadman" feature and controller

Sash fixtures.....	Adams & Westlake
Seats.....	Hale & Kilburn No. 900 rotating
Seat spacing.....	35 in.
Seating material.....	L. C. Chase Co., Byzantine plush, gray and brown
Slack adjusters.....	Westinghouse type J
Steps.....	Stationary
Step treads.....	Stanwood self-clearing
Trucks.....	Baldwin Locomotive Works, equalizer type
Ventilators.....	Railway Utility Company
Wheels.....	Roller steel, 36 in. diameter

The ten trailers are identical in design and dimensions with the motor cars. They are fitted with control including full safety equipment the same as on the motor cars. The air brakes are Westinghouse ATU, trailer type. The trailers seat 50 passengers as compared with 48 for the motor cars on account of a slight rearrangement of the toilet. Weights are as follows:

Number of seats.....	50
Date of delivery.....	July 26, 1927
Weights:	
Car body.....	60,000 lb.
Trucks.....	33,200 lb.
Equipment.....	3,000 lb.
Total.....	96,200 lb.



Plan of one of the new South Shore motor units. The general dimensions of the trailers are identical

\$300,000 Railway Order for Japan

Contracts have recently been let by the Tobu Railway of Japan for 28 motor-coach equipments, sixteen trailer-coach equipments and two completely automatic rotary converter substations to supply 1,500 volts direct current for the electrification of the 50-mile stretch of railway from Sugito, on the Asakusa-Kuzuu line, to Nikko. This order, which was awarded to the English Electric Company of London, is valued at approximately \$300,000. It is the fourth placed by the Tobu Railway with the same company and is additional to contracts for the supply of twenty motor-coach and fourteen trailer-coach equipments previously awarded by it to this concern.

Metal Markets Dull

Producers of the non-ferrous metals can find little ground for optimism in the market report for the week ended Sept. 27. Sales of all metals have been meager and the prices for all the more important ones are lower.

The excellent buying of last week has been followed by a wave of lassitude, and the tonnage disposed of during the week ended Sept. 27 was one of the smallest of the year. Most sellers feel confident that the present lack of interest is only a passing phase, and have merely quoted 13.25 cents. Certain sellers who pursue the policy of always disposing of their output irrespective of market conditions have made large concessions from this price, and in consequence have practically monopolized the market. To obtain a price of even 13 cents, however, they have been compelled to make a wide canvass of the consumers.

The most that can be said for the lead market is that the American Smelting & Refining Company is holding firm at its contract price of 6.25 cents in spite of a quiet domestic demand and continued reductions abroad, which have brought the London spot price today to £20½, the lowest level reached since March, 1922. The leading producer in the Middle West has gone back to 6

cents St. Louis, which seems to be the deadline for the time being, so far as this seller is concerned.

Less zinc was sold in the week ended Sept. 27 than in any other week since February. On Sept. 28 zinc sold as low as 6.075 cents, though forward deliveries were higher.

Tin has broken through the 60-cent level, and is down to about 58½ cents for prompt Straits, forward being about half a cent less.

Twenty Car Sets Sold Sao Paulo Company by Canadian Car & Foundry

The Canadian Car & Foundry Company, Ltd., Montreal, Canada, recently furnished twenty sets of car parts for the twenty new units built by the São Paulo Tramway, Light & Power Company, Ltd., of Brazil. The new units were placed in service on May 5. Their interior finish is of fine quality national wood, highly varnished, which, combined with a creamy white ceiling and a diffusion of illumination with opal reflectors, at all times gives a restful and pleasing atmosphere. The outside color scheme is composed of Tuscan red paneling surmounted by framing finished with cadmium yellow. This gives the cars a bright and attractive appearance.

The units are of the one-man, two-man type and they are adaptable to the pay-enter or pay-leave method of operation. The company built an experimental car before decision was made to construct the twenty units. In outside appearance the cars are very much after the order of the usual type of American units. The seating arrangement is a departure from American practice, however, in that there are two longitudinal seats at either end of the car and facing four crosswise rattan slat seats in each case.

Noiseless Trolley Experiments

Noiseless trolley service is being sought by the Eastern Massachusetts Street Railway. Experiments with noiseless trucks are being conducted on the system by a representative of the J. G. Brill Company of Philadelphia, under an understanding that if satisfactory results are obtained the Eastern Massachusetts will have its cars equipped with new Brill trucks.

ROLLING STOCK

HOLYOKE STREET RAILWAY, Holyoke, Mass., received one Mack city-type bus, gas-electric drive, 196-in. wheelbase, with four-cylinder motor and 25-passenger capacity.

SOUTHERN PACIFIC MOTOR TRANSPORTATION COMPANY, bus-operating subsidiary of the Southern Pacific Railroad, San Francisco, Cal., has accepted delivery on two Mack buses, 230-in. wheelbase, with four-cylinder motors.

The buses will operate between Santa Cruz and Boulder Creek, a route 16 miles long, at a 50-cent fare.

BINGHAMTON RAILWAY BUS LINE, INC., subsidiary of the Binghamton Railway, Binghamton, N. Y., has received three 25-passenger Mack city type buses, AB model, 196-in. wheelbase.

SHORE LINE MOTOR COACH COMPANY, subsidiary of the Gary Railways, Gary, Ind., announces the acquisition of a 42-passenger parlor-type twin coach. The unit is a six-cylinder type. It was built by the Frank R. Fageol Company, Oakland, Cal., and will be used in main line service between Chicago and Muskegon, Mich.

TRACK AND LINE

COLUMBUS RAILWAY, POWER & LIGHT COMPANY, Columbus, Ohio, has completed the laying of new track on High Street, between Arcadia and Oakland Park Avenues, a distance of about ½ mile.

CONNECTICUT COMPANY, Bridgeport, Conn., has been granted permission by the Public Utilities Commission to make changes in its line west of Ash Creek to Library Corner in the town of Fairfield. The company will abandon the present trolley line and give service over the new highway to be known as the Fairfield cut-off. The new route will be considerably shorter, and the company proposes to lay a double-track line. The old route was a single-track affair with numerous switches to cause service delays. Public approval has been voiced on the change.

ST. JOSEPH RAILWAY, LIGHT, HEAT & POWER COMPANY, St. Joseph, Mo., has completed a track job on Alabama Avenue. As soon as this was finished work was started on laying new tracks, steel ties and new concrete between Eighth and Eleventh Streets. Later on the company will rehabilitate its line on Alabama Avenue from Lake Avenue west to the railroad tracks.

READING TRANSIT COMPANY, Reading, Pa., has been busy with a program of track rehabilitation during the spring and summer months which has included relocation and reconstruction of the double track on Aulenbach Cemetery Hill. Another important piece of work under way is the complete rebuilding of the track on North Eleventh Street between Marion and Amity, a distance of about three blocks. The track area is being paved with asphalt on a concrete base, finished off with granite liners. Work on North Eleventh Street will cost about \$18,000. In addition the company has done considerable repair work, special work switches, etc., at Sixth and Washington Streets and Third and Chestnut Streets and at Fourth and Centre Avenues. Track joints have been raised along the entire route of the Eleventh Street line, except in the section of new track on Schuylkill Avenue and on Penn Street.

METAL, COAL AND MATERIAL PRICES F. O. B. REFINERY

Metals—New York		Sept. 27, 1927
Copper, electrolytic, cents per lb.		12.80
Copper wire, cents per lb.		15.25
Lead, cents per lb.		6.25
Zinc, cents per lb.		6.15
Tin, Straits, cents per lb.		58.75

Bituminous Coal, f.o.b. Mines

Smokeless mine run, f.o.b. vessel, Hampton Roads, gross tons.	\$4.175
Somerset mine run, Boston, net tons.	1.80
Pittsburgh mine run, Pittsburgh, net tons.	1.95
Franklin, Ill., screenings, Chicago, net tons.	↑
Central, Ill., screenings, Chicago, net tons.	↑
Kansas screenings, Kansas City, net tons.	2.70

↑Quotations withdrawn because of strike.

Materials

Rubber-covered wire, N. Y., No. 14, per 1,000 ft.	\$5.55
Weatherproof wire base, N. Y., cents per lb.	5.20-5.70
Cement, Chicago net prices, without bags.	2.05
Linseed oil (5-bbl. lots), N. Y., cents per lb.	11.2
White lead in oil (100-lb. keg), N. Y., cents per lb.	13.75
Turpentine (bbl. lots), N. Y., per gal.	\$59.0



"They have built a high wall of "Peacock" Staffless Brakes—"

Reg. U. S. Pat. Off.

An amazingly high percentage of modern trolley cars in service are equipped with Peacock Staffless Brakes. We recognize in this the decision of company executives to provide the last possible safeguard. They have built a high wall of Peacock Staffless Brakes to stand between their patrons and the menace of ever present emergencies of traffic.

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890 Ellicott Sq., Buffalo, N. Y.

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Lyman Tube & Supply Company, Limited, Montreal, Canada

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you want this rim

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To truck owners and operators: If your operating conditions call for a change-over from solid to pneumatic tires—single or dual rears—this equipment will do the job in the most efficient, economical and practical way.

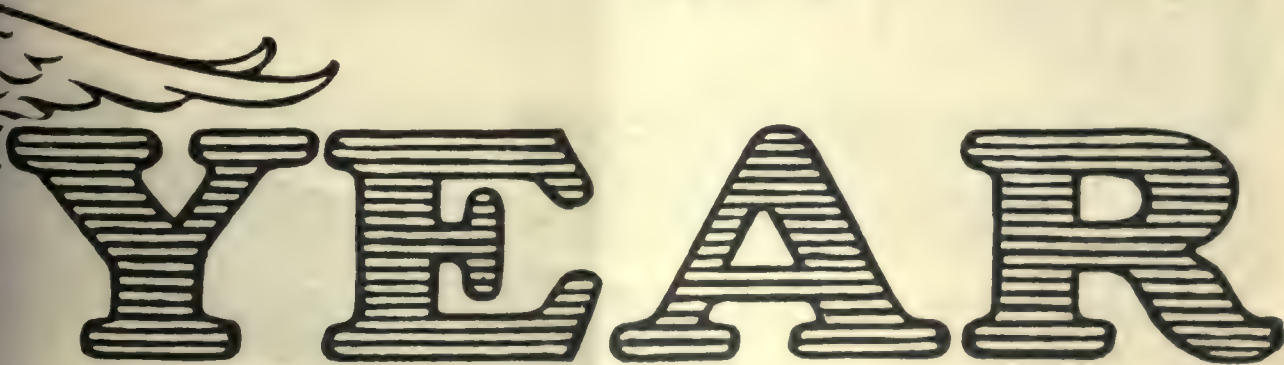
To truck dealers and tire dealers: Every distributor and dealer owes it to himself to learn the advantages offered by this equipment. Rim distributors co-operate in adapting wheels.

Outstanding advantages of the Goodyear Type K Rim:

1. Simplicity and ease of operation in tire changing.
2. Adaptability to all types of wheels—single or dual.
3. Lightness with strength.
4. Economy of replacement.
5. Reduction of brake-drum heat through use of ventilated wheels. Saving of tires.

Consists of but two parts—one endless section and one split section. Makes all pneumatic tires quickly detachable as well as *demountable at the rim*. Offers a complete range of sizes.

Developed by Goodyear engineers, made exclusively in the Goodyear shops, widely accessible through rim distributors. Your permanent satisfaction pledged by The Greatest Name in Rubber. Illustrated booklet gladly sent upon request. Write Goodyear, Akron, Ohio, or Los Angeles, California.



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Brake Hangers

Brake Levers

Pedestal Gibs

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Center Bearings

Side Bearings

Spring Post
Bushings

Spring Posts

Bolster and
Transom
Chafing
Plates

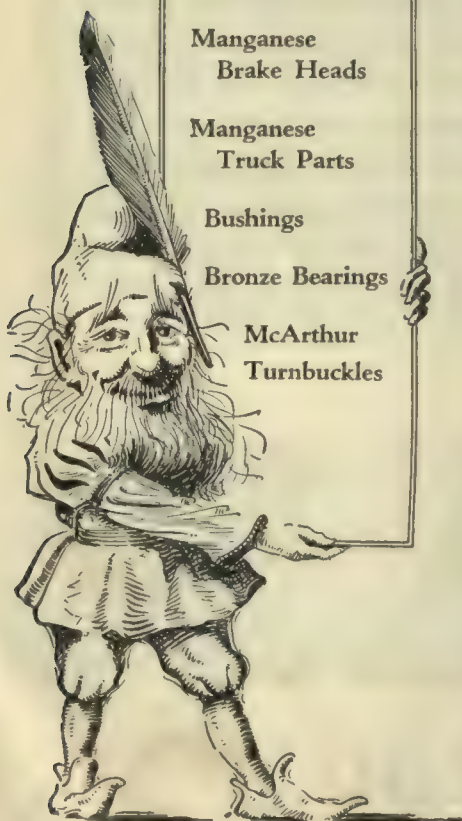
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Electric Railway Supplies
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A MODERN CAR SEAT!

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This seat has deep, double spring cushions. Mechanism rails are set in. The individual backs are properly pitched for comfort.

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We shall be glad to send you complete information on this practical seat, as well as a copy of our new Bus Seat Catalogue.



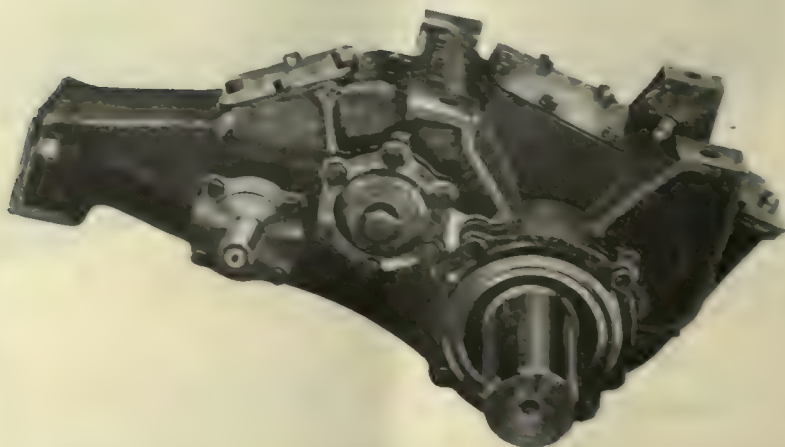
Heywood-Wakefield
REG. U.S. PAT. OFF.

Heywood-Wakefield Co., Wakefield, Mass.; 516 West 34th St., New York, N. Y.; 439 Railway Exchange Bldg., Chicago, Ill. H. G. Cook, Hobart Bldg., San Francisco, Cal. The G. F. Cotter Supply Co., Houston, Texas. F. N. Grigg, 630 Louisiana Ave., Washington, D. C. The Railway & Power Engineering Corp., 133 Eastern Ave., Toronto; Montreal; Winnipeg, Canada.



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The WN drive, built by the Nuttall Company, is the latest development in electric car drives. The high reduction secured in the WN drive allows the use of high speed motors, giving lowered initial cost, greater economy of operation, less weight and greater speed and acceleration. The WN drive is light, compact, quiet and efficient—a drive that will revolutionize the electric railway industry.

See the WN drive on the car exhibited by the J. G. Brill Co., and also in the exhibit of the Westinghouse Elec. & Mfg. Co. at the A.E.R.A. Convention.

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A complete directory of the electric railway companies in the United States, Canada, Mexico and the West Indies.

Names and addresses of officials and principal department heads, including purchasing agents, master mechanics, supt. of power plants, etc.

Names of subsidiary bus companies.

Names of principal communities reached by each company.

Names and addresses and officers of affiliated holding or controlling companies and lists of properties controlled by each.

Location of repair shops.

Location and the total capacity of power plants.

Mileage of the road, owned, leased and trackage rights.

Gage of track.

Number and kind of cars used.

Number of buses operated.

Number of garages, capacity and their location.

Rates of fare.

Transmission and trolley voltages.

Officers and executive committees of Electric Railway Associations.

Commissioners and principal assistants of National and State Railway and Public Utility Commissions.

Alphabetical list of electric railway officials, giving company connections.

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Ploughing its course at flying speed through the open stretches of the country, or nosing its way cautiously through the congested sections of the city, the interurban car demands the best there is in equipment,

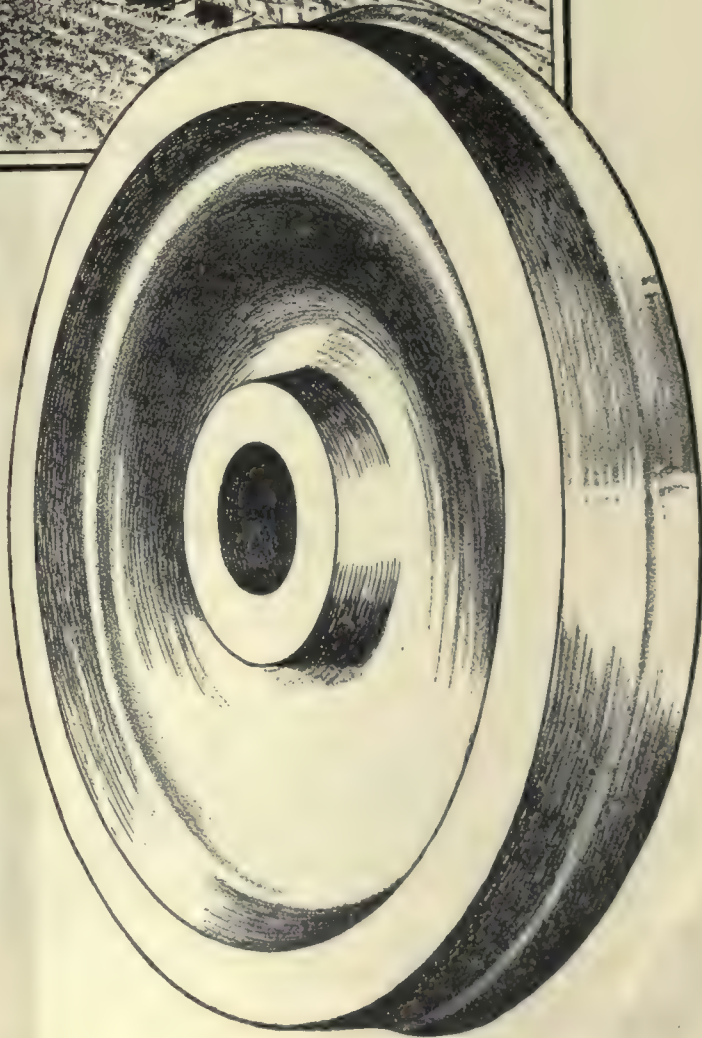
The wrought steel structure of Gary Wheels offers freedom from fractured flanges, cracked plates and chipped rims; rolled steel against rolled steel offers superior braking contact, especially appreciated in emergencies; and the principle of multiplied mileage offers an exceptionally low cost per mile of service.

*Our wheel engineers will be glad
to explain further.*

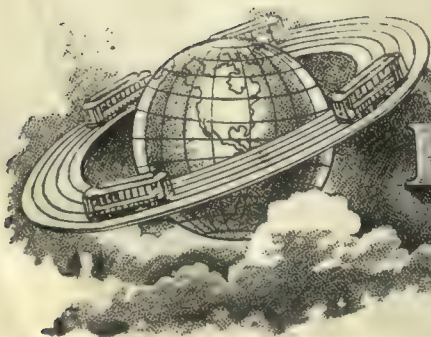
Illinois Steel Company

General Offices:

208 South La Salle Street
Chicago, Illinois



JUST as the electric railway companies have to compile and be guided by exhaustive statistics as to peak loads, traffic densities, costs per mile, and so forth, we must constantly keep ourselves informed as to purchasing power, density of population and all vital market information in order to maintain our service as an active asset of your service.



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Ohmer No. 79 Ticket-Printing Register *endorsed by* *Traffic Expert*

COMING from an authority on matters concerning passenger traffic, Mr. John A. Beeler's opinion of the OHMER No. 79 Ticket-Printing Register carries tremendous weight. He is warm in his praise of this register—"small, compact, sturdy in its construction and truly a combination of mechanical simplicity and mathematical accuracy."

Mr. Beeler says that in printing and auditing, this register seems to possess every convenience that human ingenuity can devise—performing with almost human intelligence.



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"Wherever tickets are used, there is a demand for this machine," continues the eminent consulting engineer. "As transportation is one of the greatest elements of the world's require-

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The operator simply sets the levers and turns the crank. That prints and issues a ticket—and from the same type prints a duplicate record of the data on a tape locked in the register. Both the ticket and record show

date, point of departure, destination, AMOUNT, class of fare, consecutive number, and number of register. The cash turned in at the office must tally with the total of collections registered.

Write or Wire TODAY

for detailed information. Learn just how the Ohmer Ticket-Printing Register functions—how it will fit into your business—how it will safeguard your collections and simplify your accounting.

OHMER FARE REGISTER COMPANY

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Transportation Recording Devices

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OHMER ODOMETER gives accurate total of distance traveled. For motor vehicles and railways.
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OHMER FARE REGISTERS of many types and sizes for accurately and quickly recording the details of fare collections on all kinds of passenger conveyances.
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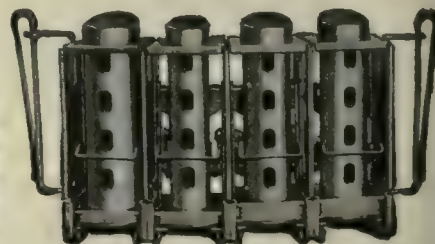
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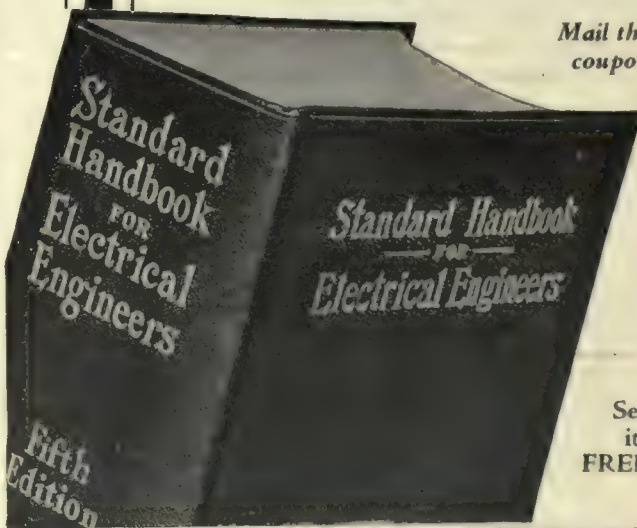
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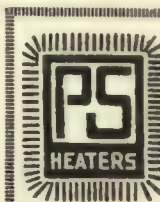


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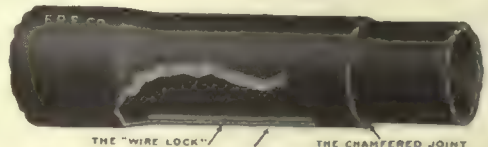
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(Continued on page 40)

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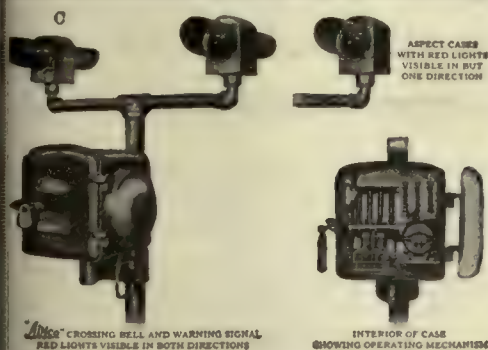
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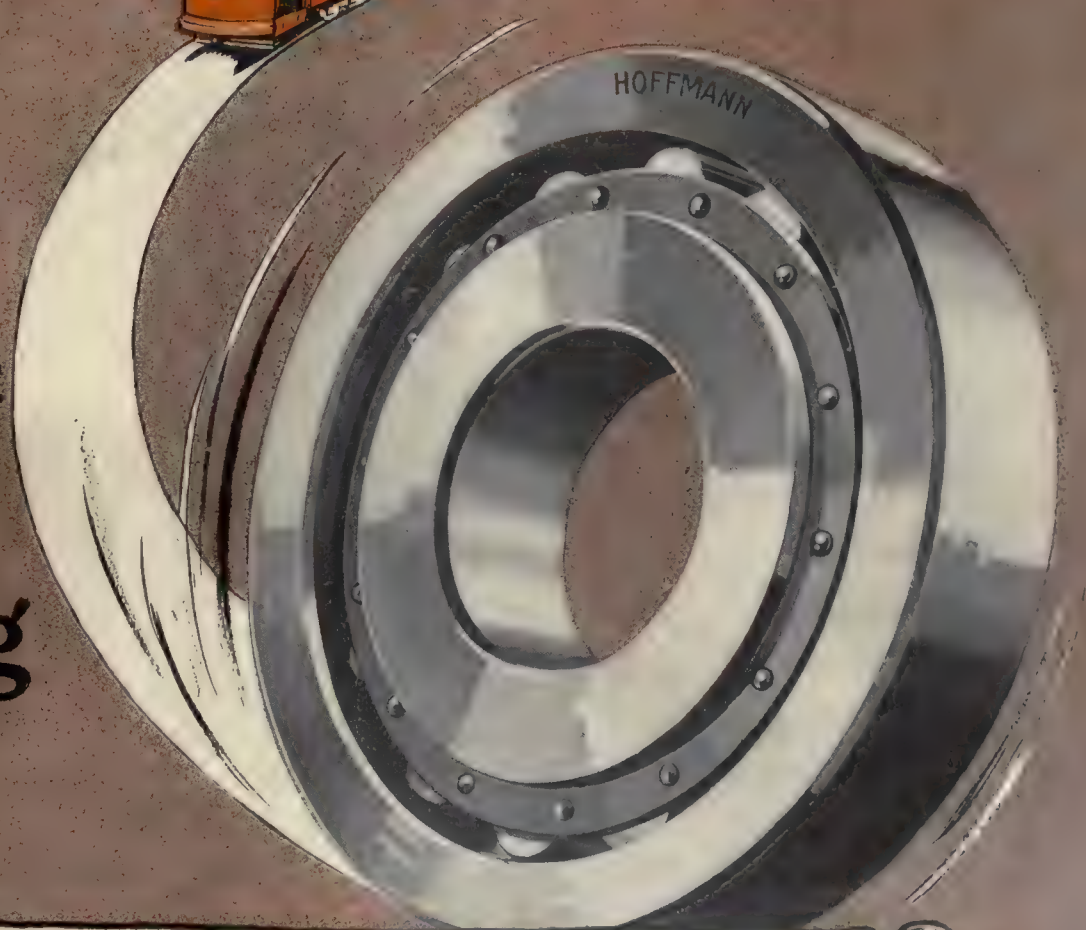
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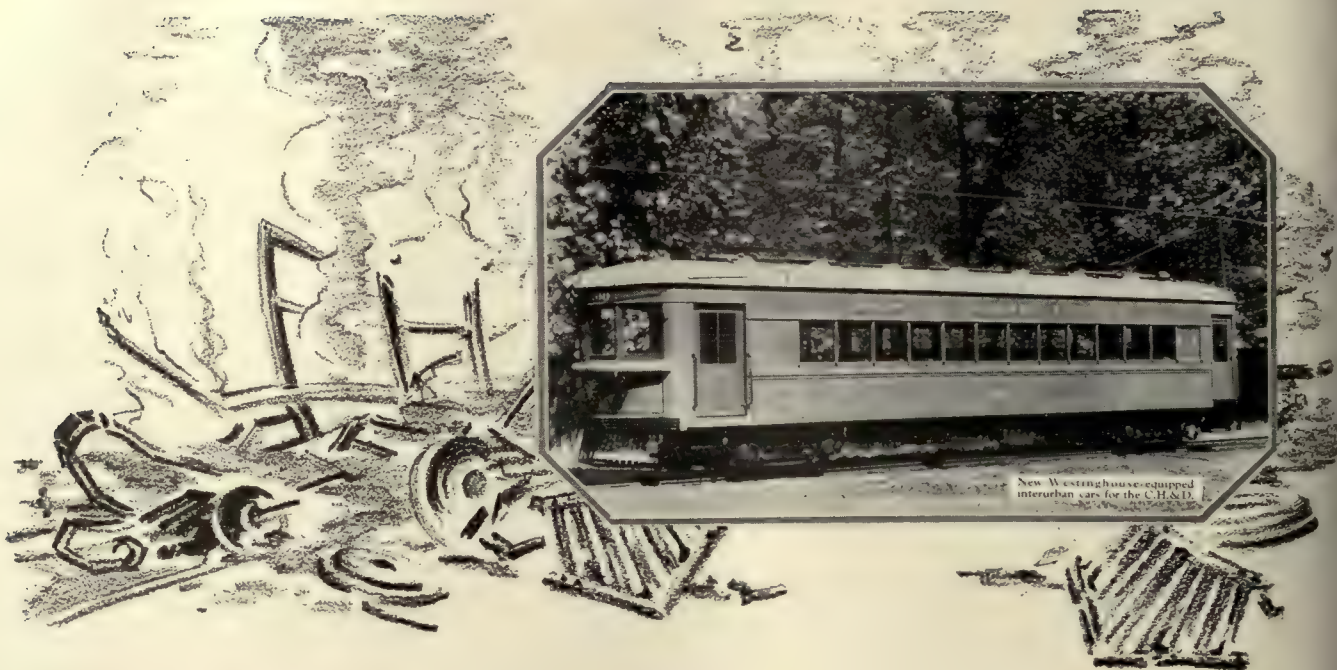


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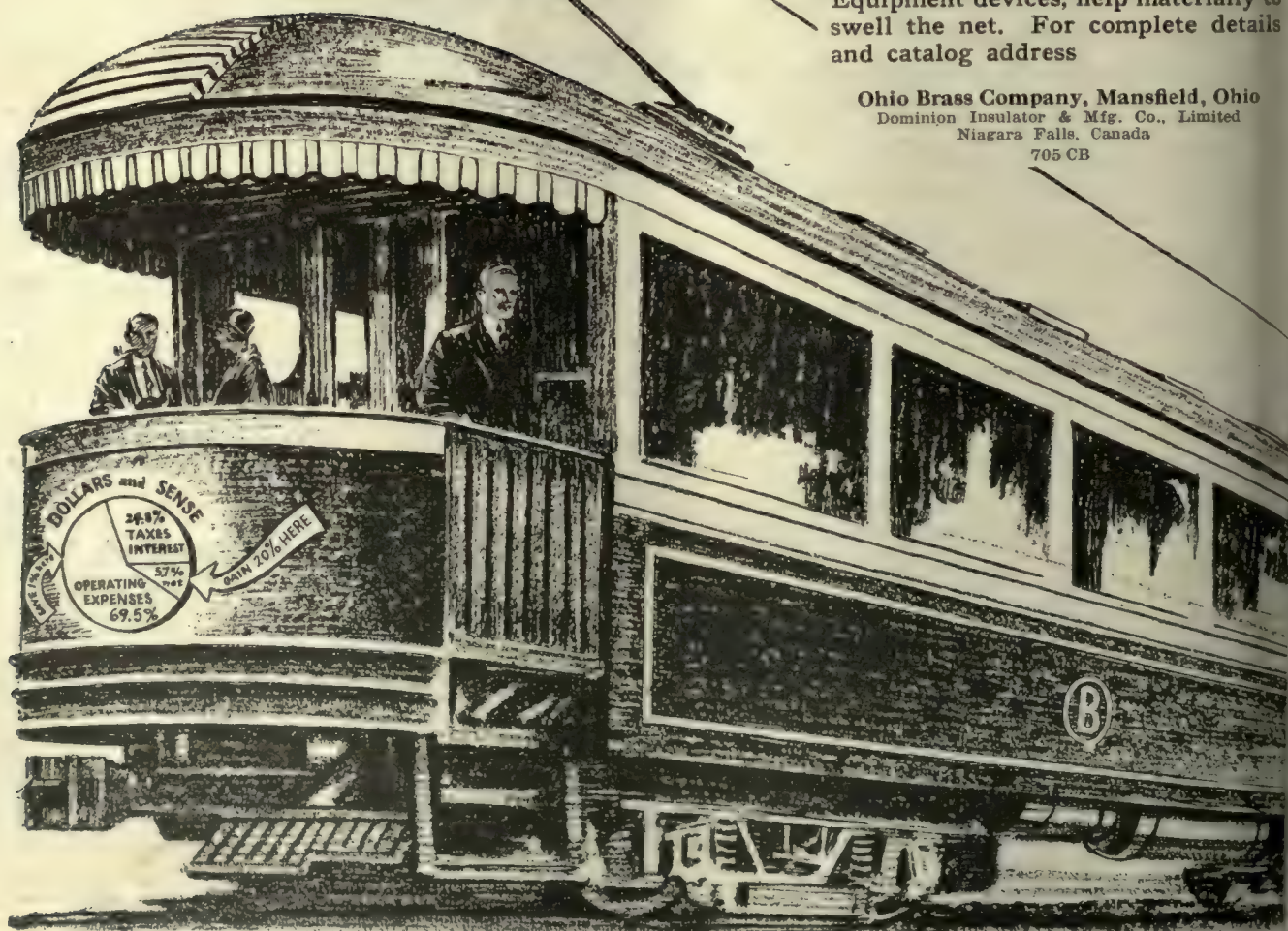
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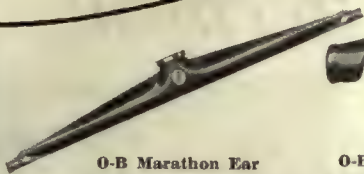
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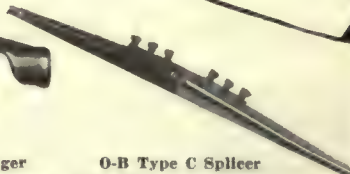
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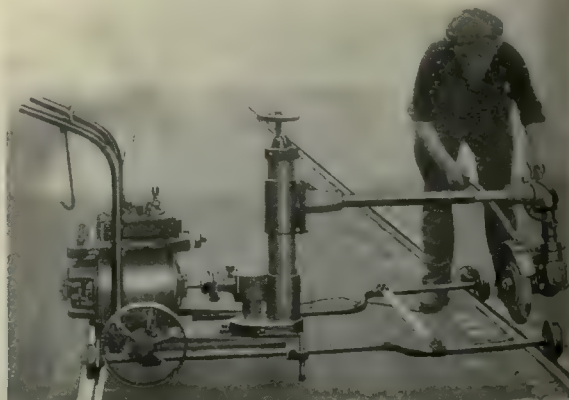
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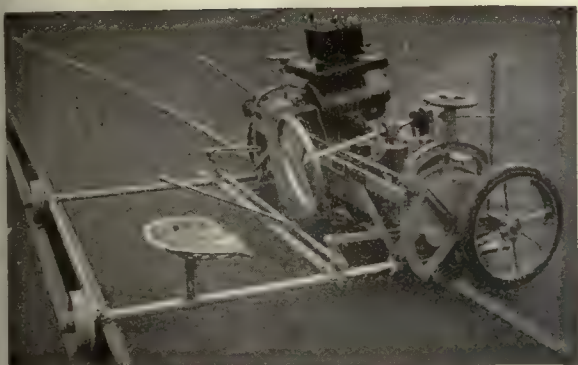
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Eureka with Outtrigger for open track.

DEMANDS BETTER TRACK

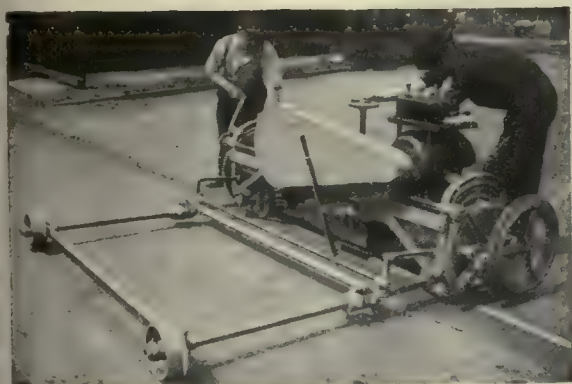
Here are other standard aids on successful roads



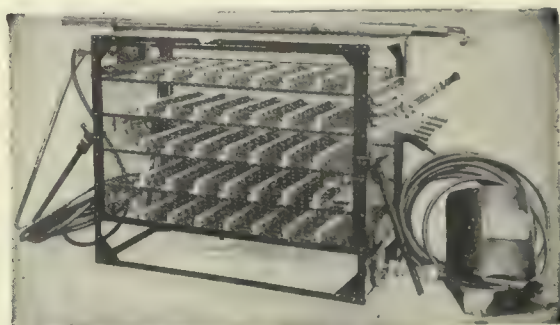
"Improved Atlas" Rail Grinder



Reciprocating Track Grinder



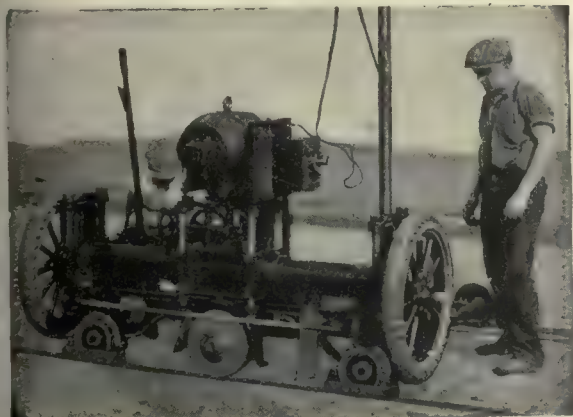
"Vulcan" Rail Grinder



"Ajax" Electric Arc Welder



"Hercules" Swing Frame Rail Grinder



"Imperial" Track Grinder

Railway Trackwork Co.

3132-48 East Thompson Street, Philadelphia

AGENTS:

Chester F. Gailor, 30 Church St., New York
 Chas. N. Wood Co., Boston
 Electric Engineering & Mfg. Co., Pittsburgh
 H. F. McDermott, 208 S. LaSalle St., Chicago
 Equipment & Engineering Co., London
 P. W. Wood, Railway Supply Co., New Orleans, La.
 Frazer & Co., Japan

No Expense for Maintenance



The whole purpose of the "One-Wear" Steel Wheel is to give a prolonged uninterrupted service life without periodical re-turning.

Thus maintenance is avoided and availability of equipment is increased.

But to desire these advantages is not to have them. It takes a special wheel metal found only in Davis "One-Wear" Steel Wheels to develop the unusual qualities that give life to the "One-Wear" idea.

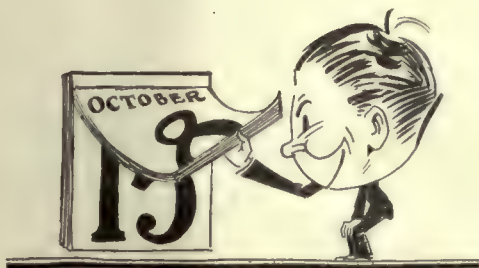


AMERICAN STEEL FOUNDRIES

NEW YORK

CHICAGO

ST. LOUIS



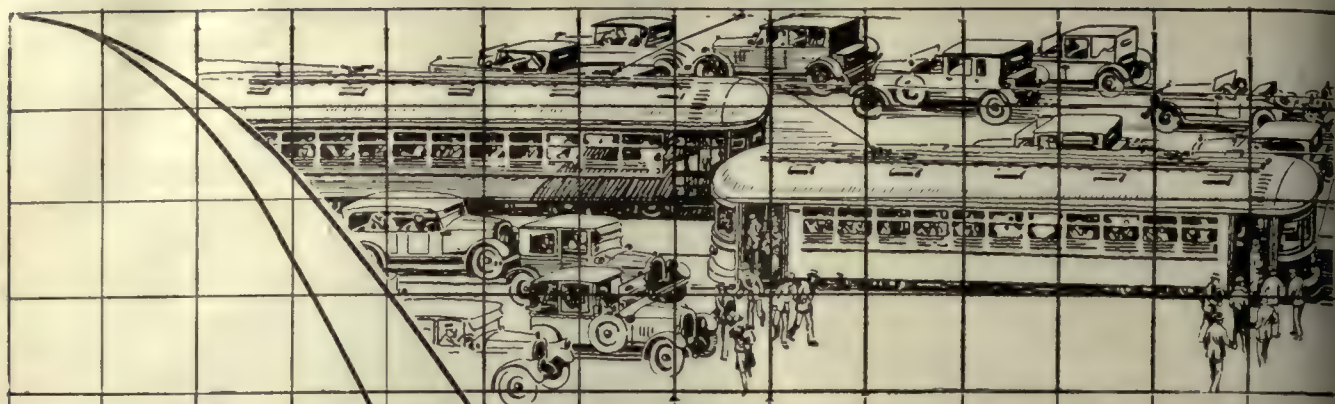
NEXT WEEK

We will announce complete details and specifications of the new tie-laying and the new compression tamping machines that caused so much comment at the AERA convention.

These new machines make the track dollar go farther, make the maintenance dollar more unnecessary than ever.

THE INTERNATIONAL STEEL TIE CO.
CLEVELAND, OHIO

TWIN TIES ARE ALL STEEL



The Westinghouse Variable Load Brake

Accelerating Traffic by Better Decelerating

helps to accelerate traffic

—because—

It automatically adjusts braking effect to suit car loading.

Its effectiveness is independent of fluctuation in main reservoir pressure.

It decreases the time of brake application and release.

It permits a higher rate of retardation.

The result---consistently shorter stops.

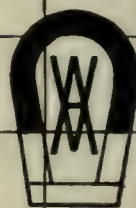
Let our representative amplify and demonstrate these statements. Perhaps the Variable Load Brake will help solve your traffic problem.

Westinghouse Traction Brake Co.

General Office and Works : Wilmerding, Pa.

Deceleration Curve WITH Variable Load Brake

Deceleration Curve WITHOUT Variable Load Brake



WESTINGHOUSE VARIABLE LOAD BRAKE



And NOW

A TWO YEAR COMPARISON
of the CHEVY CHASE COACH LINE



One year ago we gave the figures
for the first 12 months operation

They told their own story

Today, comparison shows greater
gains and lower costs for this sec-
ond year.



YELLOW COACHES *do* BUILD REVENUE



1st Year Operation

year ending September 14th, 1926



Miles operated	344,666
Revenue passengers	283,275
Earned revenue	\$70,818.75
Earned revenue per mile	20.6c
Operating expense per mile	22.25c



YELLOW COACHES MADE GOOL
IN WASHINGTON ON A 25-CENT
FARE DE LUXE SERVICE—



2nd Year Operation

year ending September 14th, 1927



375,256	=	30,590	GAIN
354,196	=	70,921	"
\$88,548.95	=	\$17,730.20	"
23.6c	=	.03c	"
21.39c	=	.86c	"



NOW SEE WHAT THEY DID
THE SECOND YEAR FOR THE
CAPITAL TRACTION COMPANY

How and where the reduction of .86c. in operating cost was made

FROM the very beginning, the operation of the exclusive Chevy Chase Coach Line was a success.

Inaugurated on September 15, 1925, to operate on a route eight miles long, connecting the Chevy Chase suburb of Washington, D. C. with the downtown section, including the Union Station and the Capitol, *the company was making money within eleven weeks.*

Operating cost per mile the first year was 22.25c. During the second year, using the identical same items for comparison, costs dropped to 21.39c. The complete analysis is offered for inspection in the panel.

Everybody rides on the Chevy Chase Coach Line— cabinet officers, diplomats, plenipotentiaries, senators, congressmen, school children, everybody— and 70,921 more passengers rode during the second year. As operating costs per mile go down, earned revenue per mile is advancing; a clear gain of 3c. this second year over the first.

Nine Yellow Type Y Parlor Coaches are used. Do they stand the gaff? Recently the first six had the heads of their motors taken off for the first time after 100,000 miles and all were found to be in good condition. This, coupled with the fact of 213,493 coach miles and only one stop for mechanical trouble, shows the kind of service being rendered by Yellow Coaches.

Yellow Coach plus General Motors are at *your* service to help you build up profitable operations.

Cents Per Mile

	FIRST YEAR	SECOND YEAR
MAINTENANCE		
Buildings.....	0.30	0.02
Bus Bodies.....	0.39	0.31
Bus Chassis.....	1.12	1.25
Tires and Tubes.....	1.75	1.73
Shops and Garage Equipment.....	0.01	0.01
Service Cars.....	0.06	0.02
Maintenance and Operation		
Depreciation.....	5.13	5.20
	8.76	8.56
GARAGE OPERATION		
Garage Employees.....	1.41	1.40
Garage Supplies and Expenses	0.66	0.43
	2.07	1.83
TRANSPORTATION		
Chauffeurs' Wages.....	5.66	5.66
Gasoline.....	3.38	2.89
Lubricants.....	0.22	0.34
Other Transportation Expenses	0.47	0.25
	9.73	9.14
TRAFFIC PROMOTION		
Advertising.....	0.04	0.05
GENERAL AND MISCELLANEOUS		
Officers' Salaries.....	0.32	0.30
Injuries and Damages.....	0.11	0.59
Insurance.....	0.01	0.05
Rent of Equipment.....	0.16	0.02
Miscellaneous and General.....	0.05	0.01
	0.65	0.97
Taxes.....	1.00	0.84
Operating Expenses and Taxes	22.25	21.39

YELLOW TRUCK & COACH MANUFACTURING CO.

SUBSIDIARY GENERAL MOTORS CORPORATION

5801 WEST DICKENS AVENUE, CHICAGO, ILL.



For Your Ready Reference ESSCO Catalog No. 7

To increase your patronage, add attractiveness and efficiency to your cars by selecting your equipment from the broad line of Keystone Car Specialties.

They're all listed, described and illustrated in ESSCO Catalog No. 7.

Send for your copy today!

Some items found in ESSCO CATALOG No. 7

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|------------------------|-----------------------|
| Golden Glow Head- | Automatic Door |
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| Steel Gear Cases | Peerless Coil Winding |
| Motorman's Seats | Tools |
| Lighting Fixtures | Peerless Armature |
| Headlight Resistances | Machines |
| Air Sanders | Insulating Materials |
| Trolley Catchers | Casa Commutator |
| Shelby Trolley Poles | Stones |
| Rotary Gongs | Sand Driers |
| International Fare | Peerless Pinion |
| Registers | Pullers |
| Fare Register Fittings | Employees' Badges |
| Samson Cordage | Line Material |
| Air Valves | Portable Lamp |
| Cord Connectors | Guards |
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Home office and plant at 17th & Cambria Sts., PHILADELPHIA; District offices at 230 So. Clark St., CHICAGO; 50 Church St., NEW YORK; Bessemer Bldg., Pittsburgh; 88 Broad St., Boston; General Motors Bldg., Detroit; 316 N. Washington Ave., Scranton; Canadian Agents, Lyman Tube & Supply Company, Ltd., Montreal, Toronto, Vancouver.

ELECTRIC SERVICE SUPPLIES Co.

MANUFACTURER OF RAILWAY, POWER AND INDUSTRIAL ELECTRICAL MATERIAL



Safeguarding accelerated Transportation Service

The objective of modern railway systems is to expedite the movement of traffic—for the sake of their patrons and their profits.

There is a growing demand today for—

More frequent service—

Shorter, quicker stops—

Less delay at entrance and exit—

A speedier getaway—

And, maintenance of the basic element of safety.

All these requirements are met to an efficient degree when complete protective and convenience-promoting devices are provided—as embodied in Safety Car Control Equipment. Accelerated transportation service is thereby adequately safeguarded.



SAFETY CAR DEVICES CO.

OF ST. LOUIS, MO.

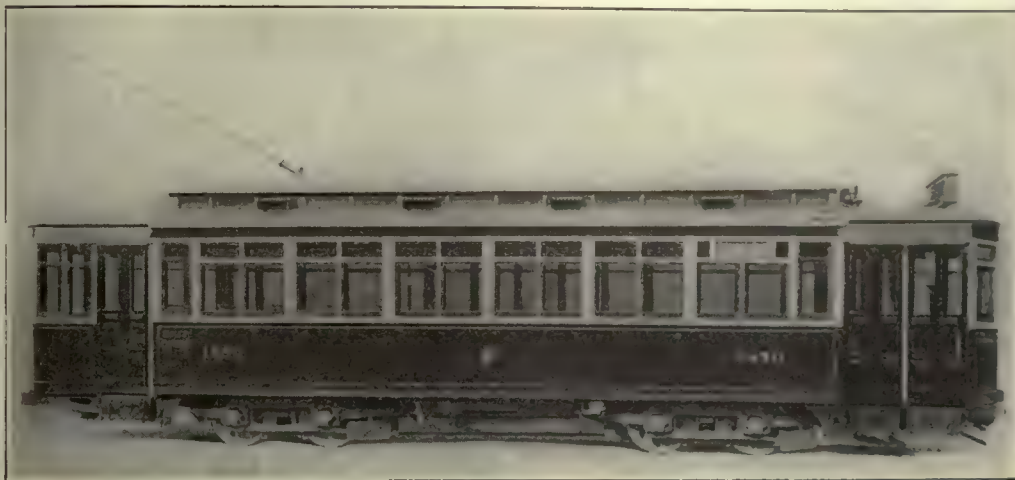
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*We make the Safety Car Control Devices
which make the Safety Car.*

TORONTO



NP

Fifty-Two More Cars Equipped With Treadles

Toronto is but one of more than sixty cities where the use of NP Treadle Exit Doors is rapidly extending. Two hundred and sixteen treadle cars are now operated in this city—an increase of fifty-two cars in the last twelve months and an indication of the growing popularity of treadles among both operators and the public.

NATIONAL PNEUMATIC COMPANY

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CHICAGO
518 McCormick Building

MANUFACTURED IN
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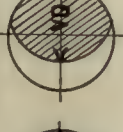
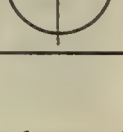
Railway & Power Engineering Corp., Ltd.

PHILADELPHIA
1010 Colonial Trust Building

MODERN OVERHEAD IS A MEASURABLE ECONOMY

We have spoken
of Phono's
greater safety
and freedom
from Wire
breaks—

Here are figures
to prove it!

		COPPER		PHONO-ELECTRIC	
		B.S.Lb.	CONDITION	B.S.Lb.	CONDITION
	V.D.—364.8 mils Area—.1046 sq. in.	5520	New	8200	New
	V.D.—300 mils Area—.08108	4280	Good	6360	Above new copper
	V.D.—275 mils Area—.07214	3810	Fair	5650	Still above new copper
	V.D.—250 mils Area—.0633	3340	Dangerous	4960	Above good for copper
	V.D.—200 mils Area—.0466	2460	must come down	3650	Dangerous
	V.D.—150 Area—.0311	1640	Down	2435	Must come down

MANY important roads we have questioned gave this as the chief reason for their use of Phono-Electric Trolley Wire.

Certainly when Phono is installed over busy inter-sections in the heart of such cities as Philadelphia, Cleveland, Baltimore, San Francisco and Chicago the factors of safety and uninterrupted service must weigh heavily.

The chart reproduced above shows clearly the value of Phono-Electric in this respect. But it does not show an equally important angle to the sub-

ject, which is the absolute uniformity of Phono-Electric Wire, foot for foot and reel for reel. The Phono Book contains a wealth of pithy information on the subject of modern overhead construction. May we send you a copy.



Ledrite Brass Rod, Phono-Electric Contact Wire, Plumrite Brass Pipe, Phono-Hi-Strength Wire, Tubular Plumbing Goods, Condenser Tubes, Sugar Tubes, Brass, Bronze and Copper Sheets, Auto, Bicycle and Pressure Pumps, Auto Accessories, Stampings, Engravers' Copper, Specialties, Screw Machine Products, Pressed or Drawn Products, Oil and Grease Guns.

BRIDGEPORT BRASS
PHONO-ELECTRIC PHONO HI-CON PHONO HI-STRENGTH

A COMPLETE WIRE SERVICE FOR ELECTRIC RAILWAYS
Bridgeport Brass Co., Bridgeport, Conn. • New York • Philadelphia • Chicago • Detroit • Cleveland



Out of the Greatest Con- vention in Electric Railway History

comes a clear
picture of the
road ahead——

— and the cars that will



*— still a step ahead
of the modern trend!*

CINCINNATI

make it most profitable

The Four Features of BALANCED DESIGN are the Cardinal Points of Today's Demand!

You have seen the finest exhibit of modern rolling stock ever assembled for the benefit of our industry. You have had ample opportunity to compare Cincinnati Balanced Lightweight Cars with the finest examples of carbuilding from other up-to-date shops.

Weigh two things more before making your final decision. First, that Cincinnati Balanced Cars are jig-built. All parts are interchangeable on any one car order. Replacements can be ordered from the factory with absolute assurance of fit. Repair and maintenance costs are reduced to a minimum.

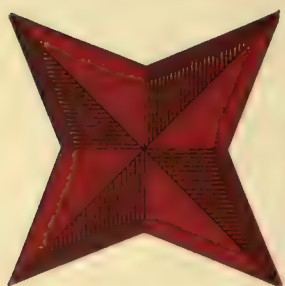
Secondly, bear in mind that by the unique Curved Side Construction of Cincinnati Cars, a full 7 inches extra inside width is possible while bettering the average hub and wagon clearances outside.

Furthermore, by building Cincinnati Cars on a thoroughly modern production basis, and by bringing both design and construction under one competent control, it is possible to produce the best in up-to-date rolling stock at a competitive price.

CINCINNATI CAR COMPANY
Cincinnati, Ohio

**BALANCED
LIGHTWEIGHT**

CARS



The above photograph illustrates a point made on the previous page. It shows part of the main erection shop in Cincinnati with the side-frame of a Cincinnati Car being built up on a special jig. Similar precision methods are used in building up the under-frame, piers and vestibule units, roof and cast aluminum window frames. In this way absolute interchangeability is assured with low production cost and the highest grade workmanship. All items well worth your consideration in choosing the cars which must make money for you, not only today but in the years to come.

—still a step ahead of the modern trend



There's Information You can Use in each of these Booklets!

AERIAL POWER CABLE—Completely covers the subject. Thirty-two pages of specific data on this type of construction.—Where Used—How to Install, (with detailed Directions)—Finely Illustrated.

HANDBOOK: OKONITE INSULATED WIRE AND CABLE—A real Handbook of 100 pages on the subject treated. Also tells how carefully Okonite Products are made, covers each principal kind of wire and cable, and explains each step in their manufacture. Profusely illustrated.

THE STORY OF STEEL-TAPED CABLE—Its development, purpose and advantages. Construction of Okonite Steel-Taped Cable, Typical installations for Ornamental Street Lighting, Police and Fire Alarm Systems, Railroad Signals, etc. Complete "Specifications" and Tables for service up to 7,000 volts.

SPICES AND TAPES FOR RUBBER INSULATED WIRES—The Importance of a Perfect Splice; The Important Properties of Tape; How to Recognize These Properties; How to Make a Perfect Splice; "Okonite", "Manson", and "Dundee" "A" and "B" Tapes. Fully illustrated.

TREE WIRE—This little book will help you solve many a line construction problem. Contains the latest information available on Tree Wire,—Why Needed—How used (with Directions for installing)—How Made. Also Specifications. Twenty-four pages; many interesting illustrations.



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VARNISHED CAMBRIC CABLES

OKONITE INSULATING TAPE

MANSON & DUNDEE FRICTION TAPES

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OKOLOOM

Okonite-Callender Products

IMPREGNATED PAPER CABLES

SUPER-TENSION CABLES

SPlicing MATERIALS

THE OKONITE COMPANY. THE OKONITE-CALLENDER CABLE COMPANY, INC.

FACTORIES: PASSAIC, N. J. PATERSON, N. J.

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F. D. Lawrence Electric Co., Cincinnati, O.

Canadian Representatives: Engineering Materials Limited, Montreal

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CHECK THE BOOKLETS YOU WANT AND MAIL COUPON TODAY.

THE OKONITE COMPANY, PASSAIC, N. J. Please send me booklets as marked below:

U. S. J.

Name

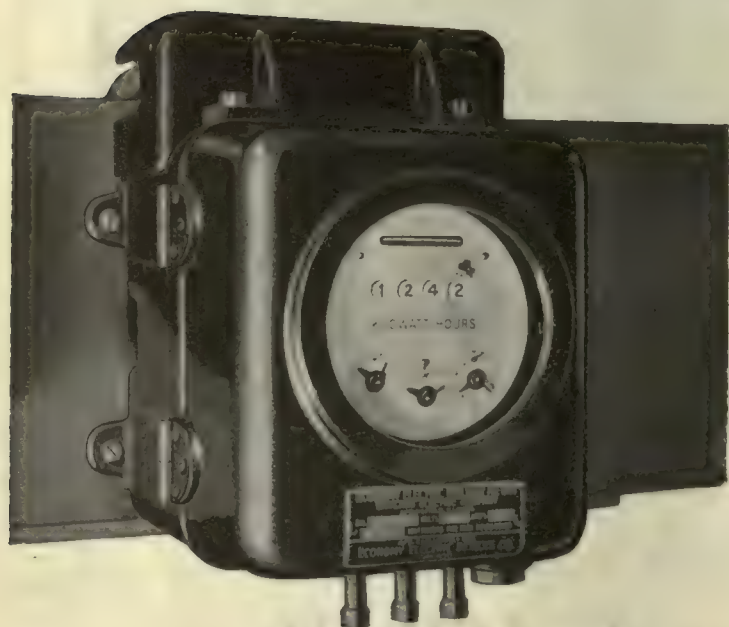
Street Number..... City and State.....

Official Position..... with.....

☐ OKONITE HANDBOOK ☐ AERIAL POWER CABLE ☐ TREE WIRE ☐ SPICES & TAPES ☐ "PARKWAY" CABLE

Measuring Costs

*The first step to
Saving—*



Electric Railways

Electric Railways in 200 cities have cut the consumption of energy all the way from 10 to 20% through the use of Economy Electric Railway Watthour Meters. This comes as a natural result of competitive interest stimulated between motormen. But of almost equal importance is the reduction in maintenance costs by regular inspections. "Car Inspection Dials" on the Economy Meters set the interval for inspections in a thoroughly scientific manner.

Economy Electric Railway Meters

Economy Electric Energy Meters for Electric Railways and gas electric buses are built by the Sangamo Electric Company, which has a high reputation in the electrical industry for the quality of its products. They have mercury cushioned rotating parts, which insure their accuracy under railway and bus operating conditions.

The dials record the use of energy in plain figures, just as an automobile speedometer records distance traveled. The motorman can see that abuse of the car adds unnecessarily to his record. On the other hand, a good record goes to the credit of the motorman,

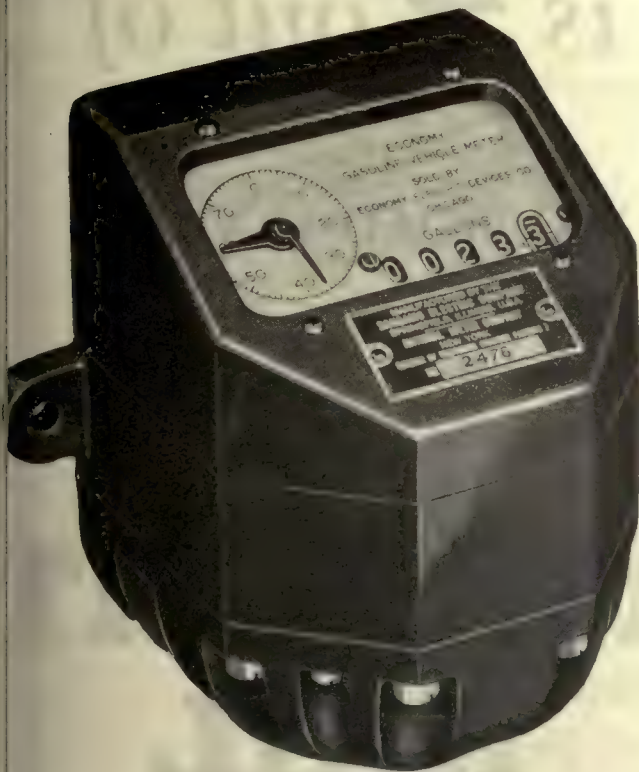
which is an incentive to careful, economical driving.

Also, the Economy Meter gives a positive indication when inspection of the car is needed. It shows at a glance how much more work a car will do before inspection is needed, and in case of breakdown, how much work it had done previous to failure. All without clerical labor.

These are prime reasons for the success of the Economy Meter. The records from Economy Meters are of high value for management and engineering purposes.

Saving Energy Saves Maintenance

Reduces Costs



Motor Transportation

Motor Transportation is in the same position as electric rail transportation in needing accurate records of energy costs. Energy for automotive equipment is measured in gallons of fuel per mile. Hence, the need for such a device as the Economy Gasoline Vehicle Meter. Records are furnished by this device of the amounts of fuel used in gallons and tenths of gallons, which can be checked against the service rendered, by men and vehicles. The meter also indicates how much fuel has been withdrawn from the tank.

Economy Gasoline Vehicle Meters

They are easily placed in the feed line between the fuel tank and the vacuum tank. They are mounted on the dash or a convenient bracket, and show at all times in clear figures the fuel being used. The driver knows whether he is wasting fuel by unnecessary idling of the engine, by racing it, or by other wasteful practices. This record is used by the management, and the driver knows it. The manage-

ment can determine where waste is occurring, due to faulty driving, or poor condition of the bus. It is also easy to check bus against bus, driver against driver, and route against route.

You will begin to see a real saving in gasoline when you meter it *as used*.

May we send literature?

Economy Electric Devices Company

37 W. Van Buren St., Chicago

Distributors or Agents for

Sangamo Economy Meters
Peter Smith Heaters

The Air Rectifier Woods Fare Boxes
Bemis Boyerized Truck Specialties

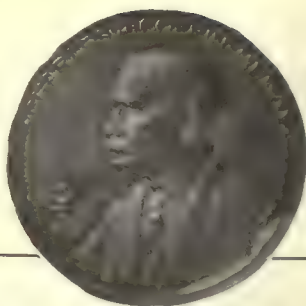
Now the score
is 4 out of 5

GRAND RAPIDS RAILROAD CO.,
winner of the 1927 Award
of the Charles A. Coffin Medal
is also a user of

THERMIT RAIL WELDS



METAL & THERMIT
PITTSBURGH CHICAGO BOSTON 120 BROADWAY



Since the Coffin Prize was inaugurated five years ago, in every year but one, the successful contestant has been a user of Thermit Welds. Surely, that is significant.

This year's winning property, The Grand Rapids Railroad Company, has been using the Thermit Insert Weld for several years as standard on its construction and maintenance work. Read what Mr. De Lamarter, the Vice-President of the Grand Rapids Company says of them:

... "Thermit Welds have been used by the Grand Rapids Railroad Company since 1923, and we have yet to find a broken weld. Thermit welds have played a prominent part in our modernization campaign in Grand Rapids and the results are all that we could ask."

The advantages of Thermit Insert Welds—smooth riding, noise reduction, less paving disturbance and low ultimate costs—explain why the conspicuously progressive electric railways use them.



CORPORATION
NEW YORK, N.Y.

SOUTH SAN FRANCISCO

TORONTO



THOUSANDS CHEER *as street cars parade in Grand Rapids*

GRAND RAPIDS caught the spirit of modern service when twenty-seven new trolley cars, light, speedy, and with comfortable seats, rolled smoothly, almost noiselessly up the street.

Best of all, these cars saved 40% in power consumption, maintained faster schedules, and increased the number of passengers carried per car mile.

Grand Rapids, like scores of other cities today, is helping people to realize more and more

- that the public *must* be served.
- that the demand for such a service will continue.
- that more passengers can be carried by the trolleys with less traffic congestion.
- that extensive improvements are being made.

Thousands cheered in Grand Rapids. Why? Because they appreciated the expression of service



Since 1888, General Electric engineers have continually contributed to the industry. G-E designed motors are used on Grand Rapids cars, and on subway cars, city and interurban lines, and electrified divisions of steam railways. G-E safety devices, brakes, and control are also a part of this complete, modern transportation service.

GENERAL ELECTRIC

Electric Railway Journal

Consolidation of Street Railway Journal and Electric Railway Review
Published by McGraw-Hill Publishing Company, Inc.
CHARLES GORDON, Editor

Volume 70

New York, Saturday, October 8, 1927

Number 15

The Significance of the Cleveland Convention

FROM the moment the exhibits were thrown open in Cleveland, last Saturday at noon, until the final meeting, conference and luncheon was over yesterday, the 4th annual convention of the American Electric Railway Association was permeated with an intangible something that the industry has not experienced in many years. One finds difficulty in naming it. Nevertheless every one in Cleveland was conscious of its presence. Maybe "an air of confidence" would be the proper term to apply. Perhaps "conviction" would be a better word; confidence in the industry's stability and conviction as to the opportunity which lies at hand. Every man who seriously attended the Cleveland convention came away with a better outlook on the industry and on his job.

Cleveland crystallized the thinking which has been developing in the industry for several years. Cleveland furnished concrete evidence of the progress that has been made. Cleveland threw a brilliant spotlight on the future and literally dazzled that vast multitude of transportation men, who came not only from every corner of America but from foreign lands as well, with the vision it revealed of the opportunities that lie ahead. The convention proved that progress is being made, because it showed concrete advance in the exhibits, talked progress in the meetings and testified to progress in the conferences. It opened up a vista of new opportunities of which the industry has for many years scarcely dared to dream. Every one seemed at last definitely to have grasped the idea that the local transportation industry is moving forward and that opportunity lies just ahead for every man who is willing to grasp it. That, in a nutshell, is the significance of Cleveland.

An Exhibit in Superlatives

ANY attempt to characterize and interpret the exhibits at the Cleveland convention leads to the use of superlatives. It was the largest exhibit in terms of the square feet of space sold and the greatest exhibit in the extent of the developments shown. Many delegates declared that it was as much beyond the 1926 Cleveland exhibit as was that great show an advance over the previous year in Atlantic City. In cars and in buses, in track and in overhead line, in electrical equipment and in shop facilities; in fact, in every department of the transportation business new ideas and improved facilities were abundantly offered.

Five distinct radical departures from conventional construction of street car trucks were shown by as many different manufacturers. For the first time in more than twenty years there was this direct effort, by fundamental changes from conventional practice in street car trucks, to meet the insistent demand for decreased noise, easier loading and reduced weight. Car bodies showed a similar

metamorphosis. The ugly duckling showed great promise of developing into a swan.

The bus gave no indications of standing still. The models shown reflected a better understanding of the automotive vehicle's sphere of operation and of the conditions under which such service can be successfully rendered. There was evidence in the designs offered of a broader understanding of the economic and merchandising aspects of this comparatively new transportation tool. There was evidence of less reliance by the bus designer on the overworked "rubber urge" as the basis for the application of his vehicle. The idea that the bus depends for its future on the decadence and replacement of railways seems to be giving way in favor of the view that the bus has an even greater future through its development as a distinctive transportation agency in its own right.

And so one could go on indefinitely. The track manufacturers are grasping the idea of applying construction production methods to the laying and maintenance of railway track. Overhead line equipment shows progress in the direction of increasing reliability and life and decreasing ultimate rather than first cost. Shop equipment and accessory manufacturers have taken new interest in the development and application of their products to the needs of the local transportation industry. Every manufacturer seems to have grasped with renewed energy his opportunity for helping to sell more and better public transportation miles. With this spirit and this point of view almost anything seems possible.

American Program Reflects Trends of the Industry

PROMINENT among the many innovations of the American Association program at the convention just ended was a series of five-minute talks by executives on a wide range of topics, the underlying theme of which was the explanation of some progressive accomplishment. Subjects all the way from rehabilitating a broken-down electric railway property to prevention of trolley wire breaks were covered. It is only a pity that the time available prevented more talks of this sort, as they carried the conviction of men who have fought their battles and won.

Another feature was the entire absence of formal committee reports. The position was taken by the program committee that these reports have been printed in advance and are available for the entire membership. Usually the time allotted for discussion on the floor of the convention is so short that only an incomplete evaluation of the work of the committee can be made.

The time saved by elimination of committee reports was used to good advantage for the presentation of a number of notable addresses by speakers from outside the industry. It is significant that all of these speakers

took an optimistic view with respect to the industry and the forward steps it is making along many lines.

It is quite significant that the arguments of a few years ago regarding the place of the bus in the transportation scheme were absent. The bus has been accepted and the affiliated associations are now discussing the exact uses to which it is best adapted, as well as the detail of how best to provide facilities for it and the technique of handling it.

Don't Wait for Costly Money

FINANCE as a subject occupied a large part in the program at Cleveland. It was dealt with by several speakers and was the topic at one of the round-table conferences. There was very little mincing of words about the matter. It is pretty well known where President Stevens stands on the importance of revamping the structures of railway companies. Some of the speakers as well, particularly Mr. Frazer and Mr. Sisson, pointed out specifically what could best be done under certain circumstances to approach the improvement which the committee on finance had in mind when it made its report two years ago.

Advantage has not been taken of the suggestions made by that very able committee after several months of study. This is particularly regrettable because the ensuing period has been one of easy money which may or may not continue. Of course, it is well known that a voluntary readjustment of financial structures is a process not easy of accomplishment. But it is far easier during a period of low money cost than it will be if action is postponed until money rates become higher. The only alternative which any company carrying a topheavy and cumbersome financial structure may hope for is a gradual improvement of its condition through the process of plowing back surplus earnings. That, at best, is a slow method. If earnings are not sufficient to keep the property abreast of developments, then it is best both for security holders and car riders to make a change in structure that will make the company's securities more salable to the public. In view of the present money situation, it seems unwise for many companies to delay changes that ultimately may prove inevitable.

After all, the basis of credit is character. Character in an electric railway means progressiveness of personnel. As Mr. Sisson said, despite the soundness of the railway business from the standpoint of its economic necessity, many properties are hard pressed for credit because of unsatisfactory franchise or contractual relationships and topheavy indebtedness, with its accompanying overload of fixed charges. The relief from improper franchises lies in proper public relations. During the past few years there have been many examples of a complete reversal of franchise conditions through the medium of giving the public a better understanding of the situation as it affects its own interest. Similarly, then, the road to financial improvement lies in the direction of better investor relations. This can be brought about only by a management which adequately appreciates the importance of the financial problem, and undertakes seriously to convince its security holders of the need for readjustment. To come back physically often means to come back first financially. It is impossible to do that unless the railway securities which are offered to the banker, and through him to the public, will stand the closest scrutiny in comparison with those of other industries.

Luncheon Conferences an Innovation

NO CHANGE made in the convention program during recent years has aroused so much enthusiasm as the series of luncheon conferences. Fourteen topics were discussed on three different days and the range of subjects was so wide that there was something of interest for every delegate. In addition to these luncheons sponsored by the American Association, several other groups met similarly to discuss common problems. Such groups were organized by leaders among the affiliated associations and provided the opportunity to consider topics on which information was desired.

Because of the smallness of the groups and the informal nature of the discussion, many members took part who never have been heard on the convention floor. Modest though they were, they all had something to contribute to the discussion. It was quite noticeable that no attempt was made by the speakers to use the time in idle talk, but each one who took part had a real story to tell. In large measure the experiences of the speaker was the subject dwelt on. Often a series of rapid-fire questions brought out details that were needed to amplify the original story until the listeners understood fully the points made. By concentrating on a single subject it was possible to cover it more thoroughly than is usual on the convention floor.

Subjects considered at the meeting were well chosen by the committee in charge. All were well attended, though some were so popular that many were unable to gain admission. The interest, however, was in no way measured by the attendance, as some of the most enthusiastic discussion was evidenced in the smaller groups. In fact these small groups on account of their size were the least formal, and on that account lent themselves to the most open statements of opinion.

Men Who Reveal the Facts

LIKE the Rosetta Stone which became the key to the long lost tongue of Egypt, so does the accountant, interpreter of countless masses of figures, unlock the secrets that lie buried deep in the intricacies of business routine. That he takes his duties seriously in the railway business was apparent during the meetings of the Accountants' Association at the Cleveland convention. There ran throughout the sessions an underlying note of earnestness, studying and thought given to the problems which arise in the accounting departments.

Even a casual visitor to the sessions of this body would have become quickly aware that these men are not limited in vision by the rules on the stationery they use. Their effort is being spent in reaching out for improved methods of gathering, presenting and standardizing accounts in a way that will facilitate analysis of operating efficiency. They are trying to improve their own performance as real interpreters of the industry.

"Dry as dust" is now a misnomer for figures. Under the skillful hand of the accountant they become deep, interesting and vitally significant. On chart and page they are made to live, and they tell a vivid story that may be either one of inspiration or of tragedy. The Accountants' Association is making real progress in improving the work of its members. They are coming to be appreciated in a new way throughout the industry by these men of facts.

The Claims Association Is Making History

HOW can a claim agent best fit himself for his job, keep his mind fresh and alert; keep up with the times?"

So was the question asked by President Proctor in his annual address. It was answered satisfactorily through the three days of meetings at Cleveland, at the Wednesday Claims lunch and in many groups of claims men—old friends meeting again and joining in helpful discussion of new problems and situations. Traffic regulation, for example, so needed as a means of accident and claim reduction, came in for both formal and informal conferences. It occupied much of the opening day's program and was taken up again to be considered from a different viewpoint at the joint meeting of the Claims and the Transportation and Traffic Associations.

It was felt unanimously that the chaos of conflicting traffic rules in cities and states constitutes a potent breeder of automobile collisions with each other, with pedestrians and with street cars, and from this thought and discussion came definite action—i.e., arrangements for the appointment of a committee to convey to the parent association the feeling of the Claims Association that the Hoover code should be fostered and stimulated so that its traffic control provisions may be incorporated into the laws of every state.

No claims man can fail to be interested in the proceedings of the closing day, with its symposium on claims subjects. It included an account of what happened in Milwaukee, where three Circuit judges sat for many weeks on an inquisition into ambulance chasing by personal injury lawyers and how the city was purged of their pernicious activities; also the last word on social conditions in Montreal, Cincinnati, Pittsburgh and other cities.

There were new faces, and younger men as well as practically all of the "regulars," at the meetings this year. No executive can afford not to have at least one of his claims men at next year's convention.

Engineering Committee Activities Bring Tangible Results

REPORTS presented this year by the various committees of the Engineering Association were notable for the number of definite recommendations contained. In most instances these committees investigated specific subjects and accomplished tangible results. They dug out the facts, examined them carefully, and stated without equivocation the logical conclusions deduced therefrom.

A good example of this method of working is furnished by the report of the committee on light-section rail. Comprehensive data were secured on the use of 7-in. grooved girder rails of various weights. From the figures obtained, it appeared that there was a considerable demand for a 7-in. rail lighter than the A.E.R.A. standard. The committee therefore recommended the adoption of a new standard, and submitted a design for a 7-in. grooved girder rail weighing 103 lb. per yard. The work of this committee was performed with the neatness of a mathematical exercise which begins with a hypothesis and proceeds through the demonstration to a definite conclusion.

Obviously, it is not possible to handle every subject in just this way. In the main, however, the reports

made by the engineering committees were presented with commendable brevity and clarity. No one could read them without getting a very clear idea of the problems and the committees' ideas of what to do about them.

Unfortunately, the same cannot be said for the reports of all the other associations. Granting that their problems are not all susceptible of the precise treatment given by the engineers to their problems, there remains, nevertheless, much opportunity for improvement. This can best be accomplished by narrowing the scope of activity of the individual committees and studying specific subjects more intensively.

Increased Speed Is a Vital Necessity

AGREEMENT among members of the Transportation and Traffic Association present at the convention was practically unanimous that increasing the speed of car operation is one of the most important problems before the industry today. Opinions differed, however, as to how this desirable result could best be obtained.

In the discussion revolving around the subject of bus operation, it was pointed out that a combination of buses to handle the local traffic and cars operated on a high-speed express schedule with infrequent stops is a possible solution of the problem. Another method of attaining a somewhat similar result is by the operation of the buses in high-speed de luxe service, while the cars carry the local riding. In Detroit the first mentioned of these plans was said to be working well, while the second has met with marked success in Pittsburgh and elsewhere.

That traffic regulation has an important bearing on the speed of car operation was emphasized at another meeting. It was the general opinion that electric railway managements should take the lead in having transportation surveys made in the cities where they operate. Only after this has been done can effective traffic regulations be formulated. Regulations based on guesswork or simply borrowed from some other city are likely to do more harm than good. It was clearly brought out that the foundation of all effective traffic regulation is exact knowledge concerning traffic flow.

Speed was considered the first and most important element in service betterment by the committee studying this subject. The necessity of improving the character of electric railway rolling stock was by no means overlooked by the members of this committee or the delegates participating in the discussion, but it was felt strongly that faster service is of even more importance than better cars. Several transportation men mentioned the desirability of using street loading platforms. This results in speeding up not only the car service but also the movement of other vehicles. The need for quicker acceleration and braking was brought out, although it was emphasized that this should not be done in such a way as to cause discomfort to passengers.

It was admitted that the average street car today is far behind the times in the matter of speed. On the other hand, it was pointed out by one of the engineers present during this discussion that there is no physical reason why the street car should not be the fastest accelerating and braking vehicle on the streets. Judging by the keen interest displayed in this matter of speed by all members of the T. & T. Association present, the electric car of tomorrow will be a faster as well as a better vehicle than the car of today.

R. P. Stevens

Newly Elected President
of A.E.R.A

R P. STEVENS, president Penn-Ohio Edison Company, was elected president of the American Electric Railway Association Oct. 4.

In Mr. Stevens the industry has a fit leader for its present-day problems and opportunities. The field of his past activities extends from Maine to Washington; the range of his abilities from practical house-wiring to broad-scale interstate development.

As recently as 1926 Mr. Stevens' Pennsylvania-Ohio Electric Company was honored with the Coffin award for most distinguished achievements in the electric railway and motor coach field. De luxe interurban cars and de luxe express coaches have ceased to be a novelty, but when R. P. Stevens put the final financial "O.K." on orders for such equipment some five to six years ago he knew he was taking something more than a sporting chance.

Here was a property of small towns and short interurbans shot to pieces from war-time hangovers and competition, with the management faced by an overwhelming propaganda to tear up the tracks and run on rubber only. But there was no weakening. Instead, there was developed the first real co-ordination of rail and coach. Side by side, the company modernized its railways and installed a higher-rate, special-stop motor coach service. When 1926 rolled around, it had completed the full depreciation on its automotive equipment and could prove that its scheme of unification had made good.

With such pioneering by its own president, the American Electric Railway Association can look forward with confidence to the coming year, with its ever-speeding trend toward finer equipment with higher standards of service for an auto-accustomed public. Having made good on his own property, anything that he has to say before fellow-workers or the general public will be greeted with redoubled respect.

On looking back over the past years, one finds that responsibilities came early to Ray P. Stevens. Born in Eastport, Maine, in 1877, his boyhood and youth knew the training of New England effort and frugality. As he made his way through high school and the University of Maine, he built up a house and hotel wiring business

to earn the wherewithal. Even his later work at the Massachusetts Institute of Technology went in tandem with jobs from the Bell Telephone Company and the General Electric Company.

After he built some lighting plants in the South for the General Electric Company, Mr. Stevens found himself at Everett, Wash., at the beginning of the century, where he practically built an entirely new system from power house and track through to cars and general organization. Returning East, he held a number of operating positions until 1907, when he achieved the presidency of the important Lehigh Valley Transit Company at the age of 30. In short order, a deficit was turned into a surplus.

Following six years successful work on what became known as the "Liberty Bell Route" through Mr. Stevens' pioneer work in ride salesmanship, he was called in October, 1913, to the presidency of the Mahoning & Shenango Railway & Light Company, Youngstown, Ohio, a corporation which has since expanded into a great interstate group of power and transportation

interests. With the expansion of these interests, Mr. Stevens found it necessary to make his headquarters in New York. There he also founded the engineering firm of Stevens & Wood.

Throughout the greater part of his career Mr. Stevens has gladly given his time and knowledge to association activities. While in Pennsylvania he was twice elected president of the Pennsylvania Street Railway Association. He is a past-president of the American Electric Railway Transportation and Traffic Association and now he has attained the highest personal honor within the gift of the industry, the presidency of the American Electric Railway Association.

Those who know R. P. Stevens appreciate his genial character as well as his broad views. If a man's character is best displayed among employees rather than equals, that of Mr. Stevens can well stand inspection. Throughout fourteen years on the Youngstown properties, labor relations, particularly in the difficult field of transportation, have been exceptionally harmonious.



Second Cleveland Convention Eclipses Last Year's

More and better exhibits, improved arrangements, and an augmented program all contribute to the most successful convention in the history of the association



Rush hour at the registration desk

FOR the second time in two years a convention of the American Electric Railway Association has been held at Cleveland, Ohio. This year, the 46th in which a convention of the association has taken place, another record has been made. More railway men registered than last year. Figures for total registration are not available, so it is not possible at this time to say whether the record in this respect will be broken. More exhibit space was used than ever before, and the exhibits were more carefully chosen.

Changes from last year's program were numerous. Committee reports were conspicuous by their absence. None but the essential routine reports were made in the American Association. The Engineering Association, which handles the greatest share of the standardization work, naturally must consider many reports of its technical committees. Even here only one afternoon was devoted to this phase of the work, the meeting being split into parallel sessions that were attended by those who were most vitally interested. The other afternoons were taken up with addresses by men from within or without the industry, who are experts on the subjects they discussed.

For the first time in the history of the association the exhibits were all in place and the doors thrown open Saturday noon, Oct. 1. The registration on Saturday and Sunday showed that many persons took the oppor-

tunity of gaining time to inspect the exhibits beforehand rather than waiting until exhibit day, as in past years. Some rearrangements in the booths made access easier, so that there was not the congestion around some of the booths as in past years. Except for a shower on Saturday afternoon the weather was fair throughout the convention, so that many more persons inspected the outdoor car exhibits than saw those on display last year.

An earnest desire on the part of all the officers of the association to hold meetings on time was noticeable throughout. Discussion was limited, so that unless the speaker really had something to say he made way for the next one without waste of time. By this means the sessions were put through on schedule and closed earlier than has been customary.

The formal opening of the convention took place on Monday morning in the Auditorium. The Cleveland Railway Male Chorus and the Pittsburgh Railways Band alternated in providing an excellent musical program. At the appointed time President Willits H. Sawyer introduced City Manager W. R. Hopkins of Cleveland, who welcomed the delegates. Headed by the band, the assemblage marched to the West Wing, where Mr. Hopkins made the formal address of welcome.

President Sawyer talked earnestly to the delegates in his annual address, stressing the opportunity to give service. Following Mr. Sawyer came a succession of

excellent addresses by men prominent in the business and political worlds. Each left an impression on his hearers.

On Tuesday, Wednesday and Thursday a series of fourteen luncheon round-table conferences was held. The subjects on Tuesday were traffic regulation, taxes, the motor bus, the trend in franchises, developing the sales instinct in platform employees and advertising. On Wednesday, cars, financing, public relations, bringing city service up to date, valuation, fares, and employee relations were the topics. On Thursday there was a single luncheon, devoted to the subject of opportunities and prospects for the interurban.

No program of the association would be complete without an address by E. F. Wickwire. This year his talk sparkled just as much as ever, and he, as in former years, made as many points that drove home.

With all its serious topics the convention was not without its moments in lighter vein. Golf was confined to Sunday. Monday evening the president's reception was held. Tuesday evening's session, sponsored by the Advisory Council, had as its entertainment feature a number of solos by Miss Anna Case, prima donna of the Metropolitan Opera Company. On Wednesday evening one of the local theaters was completely reserved for the delegates and a special show was put on with features for the members. Thursday evening the grand ball was held in the Auditorium.

The Pittsburgh Railways Band gave concerts each afternoon during the convention, and the Cleveland Railway Male Chorus also gave a series of concerts for the delegates. These features added greatly to the success of the convention.

Regulation and Traffic Control Discussed

At Monday's session of the American Association street traffic control and regulation of public utilities were the subjects of addresses by prominent speakers. Revisions of the constitution and by-laws adopted broaden the scope of the association

BRIEF exercises in the Auditorium opened the 46th convention of the American Electric Railway Association at Cleveland on Monday, Oct. 3. A concert was given by the Cleveland Railway Male Chorus and the Pittsburgh Railways Band. President W. H. Sawyer introduced City Manager W. R. Hopkins of Cleveland, who formally opened the sessions. Headed by the band the audience then marched to the meeting room in the West Wing, and the business of the day began.

In his address of welcome Mr. Hopkins paid tribute to John Stanley, late president of the Cleveland Railway, who passed away at the opening of the convention last year. He said that the work of leading and modernizing the Cleveland Railway so ably begun has been carried on successfully by Col. J. H. Alexander. The virility of the transportation industry is shown, he said, by the way it is attacking the problems of the day with energy and intelligence.

The excellent state of the finances of the association was indicated in a brief report by the treasurer, Barron Collier.

The morning was devoted to two addresses. The first by Dr. Miller McClintock, director of the Erskine Bureau for Street Traffic Research of Harvard University, and the second by Hon. W. W. Potter, Attorney-General of Michigan.

Dr. McClintock spoke on street traffic control and electric railway operation, calling attention to a number of the vital points that are essential to betterment of present conditions. It is not possible in the ordinary narrow streets, he said, to give an exclusive right-of-way to street cars. It is, however, within the limits of reason to require vehicles to leave the tracks on the approach of a car so that it can proceed.

Loading zones are essential to safety and dispatch in the handling of street car traffic, he believes, and raised platforms should be installed. Parking should not be eliminated, but it should be controlled. Double-line parking should be prohibited.

The only reason for the use of signals for traffic control, Dr. McClintock believes, is to reduce delays. At least 50 per cent of the automatic signals in use today are worse than useless. The electric railway men should see to it that the installations are made only where they can do some good.

Progressive signaling, where the lights are so changed that vehicles can progress from one end of the control zone to the other without the necessity for a stop, is the best method that has yet been devised. This reduces the unnecessary standing time and speeds all movements.

A telegram of congratulation from President Coolidge was read by the president. This appears elsewhere.

Mr. Potter, speaking on the regulation of public utilities, traced the change from unbridled competition to regulated monopoly, showing the excellent results obtained. The demands of the public have changed, but the railways have not met them, he said. The methods must be modernized accordingly and the rates needed to support them will come, as the public in the long run is appreciative. Payment for paving in the railway area is archaic, he holds. It is unfair, as the community in general is using an investment made by the railway as a result of legislation dating back to the horse car days. The general taxes of the railway are the same as those for other corporations, but the proceeds are often used to provide a right-of-way for a competitor who is attempting to take business away from the railway.

Important changes in the constitution and by-laws of the association were adopted. In brief, these will broaden the statement of the objects of the association, and will make it possible for the executive committee to admit to membership, with proper restrictions, companies operating any form of urban or interurban transportation. Other changes will provide a class of membership for the various state and sectional associations to form an effective tie with their work, and to provide for plural voting in recognition of the difference in size of the various electric railways. This is particularly important in voting on standards. The schedule of dues was revised so that the finances of the Advisory Council would be consolidated with those of the main association.

American Association Elects Officers

Ray P. Stevens is chosen as president. Association listens on Tuesday to budgets. Conditions in the industry and how the public may be pleased

FOUR outstanding addresses featured Tuesday morning's session of the American Association. The subjects were budgeting for the future, improved conditions in the industry, the changing demands of American business, and methods by which the railways may please the public.

Before the first address, Past-President J. N. Shannahan presented the report of the nominating committee. The entire ticket, headed by Ray P. Stevens for president, was elected unanimously.

George E. Fraser of the firm of Fraser & Torbet, certified public accountants, spoke on the ten-year budget. An abstract is published on another page of this issue.

M. H. Aylesworth, president National Broadcasting Company, chose as his subject "Smile and the World Smiles with You—Weep and You Weep Alone." He

said that he had originally decided to use as his title "Don't Imitate the Undertaker — He Serves Only the Dead," but that after a survey of the situation he had decided the former title would be more appropriate. He paid tribute to the way the electric railway industry has weathered the storm of the past few years and has profited greatly by the experience. A spirit of optimism and confidence, he said, is necessary if the transportation industry is to con-



C. R. Ellicott and E. D. Kilburn

vince others it is a public service essential in character.

Merle Thorpe, editor of the *Nation's Business*, forcefully told the audience of the present orgy of law-making, which is in large measure aimed at American business. Some 92,000 bills were introduced in the last session of Congress, but practically none of the old laws was repealed. The administration of these many laws is burdensome and unduly expensive. One family out of every eleven now is employed in the administration of the laws. It is Mr. Thorpe's opinion that no government can operate a business as efficiently as can a private individual. Business is not a lower type of activity than the professions, said the speaker; it is in itself a profession with just as high standards and ideals. The industrial system of America has created three times the wealth that existed previously.

We still suffer from an old-fashioned idea of a secular order as distinguished from religion, held the Rev. Dr. A. W. Wishart, pastor of the First Baptist Church of Grand Rapids. It is not possible to separate the two, for a civilization or a business or a government cannot be built on falsehood. Men who make products such as those featured in the exhibits shown at this convention cannot do it without having character. He called attention to the beauty of the modern designs, holding that utilities may be pleasing as well as useful. This is a new era. The old era of corruption, political chicanery and trickery is fundamentally wrong and is immoral. Fortunately it is passing. The old way of doing business was secretive, he continued. Now when a good piece of work has been done, instead of keeping it to himself the author can scarcely wait until the next convention to tell about it and so make it useful to others in the industry.

On motion of Mr. Shannahan a vote was passed thanking the speakers for their addresses and the program committee for having secured them.



W. E. Wood

Grand Rapids Railway Wins Coffin Award

Small property in city of 160,000 awarded 1927 prize at Advisory Council meeting. B. C. Cobb, chairman, points out industry's pressing needs. Hon. George B. Cortelyou discusses the relation between utilities and government

IN RECOGNITION of accomplishments which have had a widespread influence on the entire industry and have done much to awaken the present almost universal interest in the improvement of electric railway service, the Grand Rapids Railroad Company, Grand Rapids, Mich., was awarded the Charles A. Coffin Medal for 1927. President W. H. Sawyer, chairman of the Coffin Award Committee, who made the presentation during the Advisory Council meeting at the Cleveland convention, read the report of the committee setting forth the accomplishments of this property.

The report itself epitomized these accomplishments. With limited facilities, on its initiative and largely with its own resources, this comparatively small railway property, which was scarcely known outside of its own city a few years ago, undertook to demonstrate to the world the process of popularizing electric railways by the improvement of equipment and service. So radical were its methods, the report points out, that when it filed a brief in the competition two years ago, there was considerable doubt as to the outcome of its experiment. The present awakened interest in the improvement of cars, which has permeated to all the manufacturers and to almost every operating property in the country, received a strong impetus by the pioneering of this comparatively small company.

Its accomplishments were not all in the direction of spectacular innovations and showmanship. Combined with this there was a consistent program of increasing operating efficiency and reducing costs. With no change in the rate of fare, revenues in 1926 showed an increase of 1.04 per cent over 1925, and in 1927, when the average figures for properties of its size showed a heavy decrease, it held its revenue slightly above what it had been in 1926, despite a reduction in the activity of the basic industry in its city. For the year ended May 31, 1927, there was a reduction of 9.88 per cent in operating expenses and an increase of 20.83 per cent in net revenue in comparison with the year 1926. After charging off depreciation amounting to approximately 10 per cent of its gross, there was available after taxes a balance equal to 6.4 per cent of its rate base of \$6,000,000. This was an increase for the year ended May 31, 1927, of 41.68 per cent over the corresponding period of 1926. There had likewise been an increase in this figure for 1926 over 1925 of 15.63 per cent.

TWELVE CONTESTANTS IN 1927 COMPETITION

There were twelve contestants for the 1927 award. The committee reported grave difficulty in making a selection because of the excellence of the presentations and felt that each of the briefs was entitled to recognition



B. C. Cobb

by the industry because of the accomplishments shown by these twelve properties—namely, Birmingham Electric Company; Chicago, South Shore & South Bend Railroad; Chicago Surface Lines; Durham Public Service Company; El Paso Electric Company; Georgia Power Company; Grand Rapids Railroad Company; Little Rock Street Railway; Northern Texas Traction Company; Southern

Colorado Power Company; United Railways of St. Louis, and Virginia Electric & Power Company. Of these contestants the Northern Texas Traction Company won the award in 1924 and has continued to be a contender each year, having submitted this year its fifth consecutive brief. Two other of the above companies submitted briefs in previous years, Grand Rapids in 1925 and El Paso in 1923, 1925 and 1926.

Several of the contestants showed evidence of major accomplishments which were considered by the committee to be ample basis for granting them the award had not the prize been so closely contested by the presentation of impressive accomplishments on the part of a number of other properties.

Gross and net revenues were increased by the Birmingham Electric Company, which also effected substantial operating economies and increased riding on its cars by rerouting, new cars and frank publicity.

The Chicago, South Shore & South Bend Railroad doubled its earnings in a period of two years by a program of complete rehabilitation and by the provision of comfortable and luxurious cars designed to win the patronage of former automobile drivers. By arranging to operate its cars over the electrified tracks of the Illinois Central Railroad, an entrance to the heart of downtown Chicago was obtained, thus increasing the usefulness of the road to the territory which it serves.

Despite increased ownership of automobiles in Chicago, the Chicago Surface Lines increased its rides per capita by the improvement of service. Gross earnings were increased and greater operating efficiency was obtained by a determined program of improvement undertaken in the shadow of a receivership and in the face of an expiring franchise. Participation by the railway management in the program of reducing traffic congestion



1. Fred W. Olds
2. George Kerwin
3. R. Retan
4. J. W. Knecht
5. W. E. Livingston
6. J. Winks

7. Paul Rust
8. E. Lunda
9. S. Dubee
10. F. Heath
11. Simon Glerum
12. Ray Poteracki
13. L. J. De Lamarter

Officers and key men on prize-winning property

in the downtown district, combined with demonstrated public interest and leadership, won for it the co-operation of its community in bringing about traffic improvement. A major rerouting plan was put into effect without a serious hitch, and resulted in material speeding up of service with important operating economies. A record of efficiency was made during the Christmas holidays, by the operation of 100 per cent of all its equipment.

Continuation of a major program of rehabilitation and improvement over a number of years in the face of losses in revenue and despite those losses finally brought an upturn in the revenue curve for the Georgia Power Company. This improvement program was maintained in the face of a discouraging showing in pursuance of a policy of winning public recognition and support by the sheer weight of performance and demonstrated good faith. This property also succeeded in putting 100 per cent of its equipment in service during the holiday period.

The Little Rock Street Railway equipped its property with new and attractive cars and buses. It showed a reduction in the number and cost of accidents accompanying a change to one-man operation. One hundred per cent of the company's employees are owners of its stock.

Both gross and net revenue were increased by the Northern Texas Traction Company through the modernization of car equipment and the adoption of a scientific fare schedule.

Scientific co-ordination of street-car and bus service by the Durham Public Service Company resulted in a steady and large increase in gross and net revenue. The property shows a remarkably low record of accident costs.

The El Paso Electric Company shows increased average speeds and increased earnings with a steady betterment in its accident record.

The Southern Colorado Power Company rehabilitated its cars, increased operating speed, improved its operating and maintenance methods and succeeded in selling its securities to a large number of local stockholders.

Accomplishments by the United Railways of St. Louis, a company in receivership, include an increase in the number of passengers and in gross earnings, together with a decrease in the deficit after depreciation, taxes and interest charges. Speed was increased and improvement in power and distribution efficiency was shown by the use of a large proportion of automatic and portable substations. Accidents also showed a large decrease.

In the period of only slightly more than a year the Virginia Electric & Power Company completely reversed the opinion and attitude toward the company of the public in the communities it serves. New franchises were obtained, bus and car service was co-ordinated, large increases were made in gross and net revenue and the railway department was put on a self-supporting basis. A heavy program of rehabilitation was undertaken, exten-

sive rerouting was carried out and new fare schedules put into effect.

One of the features of the evening meeting of the Advisory Council was the annual report by B. C. Cobb, its chairman, which is abstracted elsewhere in this issue. He expressed conservative optimism regarding the outlook for the industry, pointing out that there has been no appreciable change in the number of passengers carried by electric railways and their allied motor bus lines during the past three years. The figure has remained almost stationary at sixteen billion passengers despite rapid increases in the number of automobiles owned.

Still another outstanding feature of the Advisory Council program was an address by George B. Cortelyou, chairman of the Joint Committee of National Utility Associations. Mr. Cortelyou's address is also abstracted elsewhere in this issue. Representing as it does the gas, electric and local transportation industries of the country, this committee speaks as the representative of an investment of capital approximating seventeen billion five hundred million dollars. To illustrate further the extent of the utility enterprises in this country and the widespread public interest which they represent, the speaker pointed out that the savings of approximately 5,000,000 people are represented by the investment in the utilities. He voiced the creed of this vast industry in the words, "We do not consider our job measurably complete until the public is well satisfied because well served."

An Experience Meeting of Operators Held

In five-minute talks prominent electric railway men tell how they are solving their problems.

Addresses are presented on finance and progressive methods

FOLLOWING out the general plan of devoting the meetings to formal papers, the greater portion of Thursday morning's session was taken up with addresses by E. F. Wickwire, vice-president Ohio Brass Company, and F. H. Sisson, vice-president Guaranty Trust Company. Mr. Wickwire gave one of his inimitable talks.

Mr. Sisson spoke on the financial situation. The present situation is more reassuring, he said. The public education campaigns are admirable and are producing results and the industry is becoming stabilized.

A feature of the session was a series of five-minute talks on operating problems. The first was by J. L. Alexander, Galveston-Houston Electric Company, who told of the methods used to inspire his men to greater efficiency and loyalty. In order to get the ideas over, the employees have been organized into classes.

R. H. Pinkley, Milwaukee Electric Railway & Light Company, said the methods used to meet the transportation requirements in Milwaukee include improvements in service, higher schedule speeds, and keeping the cars on schedule. Buses are used for special service, and are co-ordinated with the cars.

C. H. Jones, Chicago, South Shore & South Bend Railroad, gave some of the details of how he has developed a 300 per cent increase in business. The property was run down and about ready for the undertaker when it was taken over. The new owners had faith in the electric railway business and so were willing to incur

the expense necessary for rehabilitation. Several things in particular have been done that have improved conditions: (1) An adequate entrance into the heart of Chicago was obtained; (2) at first the company furnished service far in excess of the requirements; (3) the best possible use was made of a parallel motor coach line; (4) a campaign for freight business was begun, both carload and less-than-carload shipments being solicited; (5) a new business department was formed to solicit passenger traffic; (6) a recreation bureau learns of the attractions of the territory served and sells the idea to the general public. There is only a small amount of attention paid to solicitation of passengers, as it is felt that if the territory is built up the riders will come to the line naturally.

There has been an increase in passenger revenue during the first part of this year of 175 per cent over 1921 while the maximum increase in one month was 200 per cent.

The freight business is running at the rate of 150 per cent over 1921 while the maximum month shows a 175 per cent gain. This is a testimony, he said, that the public wants good transportation service.

Col. H. V. Alden, Timken Detroit Axle Company, spoke of the policy of his company regarding experimental work in connection with street car drives. The type of drive that was chosen, he said,



R. P. Stevens

was one that had shown itself to have the longest life.

D. W. Pontius, Pacific Electric Railway, mentioned the loss of passenger traffic due to automobile competition. Though there has been a considerable increase in population in the territory served by his lines, there has been little growth in the passenger business. The freight business is growing at a rapid pace, he said, and the Pacific Electric Railway is now the third largest freight carrier in California, being exceeded only by two steam railroads.

The electric railways in his territory are modernizing and going after business, he said. He outlined the improvements being made in Los Angeles. Lines are being double tracked where needed, and other means are being used to increase the capacity.

A. F. Townsend, Northern Texas Traction Company, Fort Worth, attributed the success in his city largely to the substitution of light-weight Birney cars operated by one man, for heavy two-man cars. Schedule speeds also were increased. In 1914 the operating costs were 10 cents per car-mile, and by 1920 they had jumped to

cents. Introduction of the new cars caused a recession to 16 cents per car-mile in 1926, though the trainmen's wages are increased 180 per cent over what they were in 1914.

H. T. Connelly, Washington, Baltimore & Annapolis Electric Railroad, told of automobile and bus competition along the 40-mile route between the terminal cities. To meet this the old two car trains have been replaced by modern articulated cars, saving 44,000 lb. in weight, and one man out of the three formerly needed. While the cars have not been in service long enough to get comparable figures, there has been a gain in traffic since their introduction.

Adrian Hughes, Jr., United Railways & Electric Company, Baltimore, said that there has been a reduction in trolley wire breaks from more than 100 per month to one in 50 days. This has been accomplished with a reduction in cost of the line department from \$100,000 a year to \$60,000 a year. The change in method was introduced in December, 1920. Previously the line crew waited until a failure occurred; now by careful inspection failures are anticipated. There also has been an improvement in material used, it being appreciated that the best is the cheapest in the long run.

The *Electric Traction* speed trophy, awarded to the Chicago, North Shore & Milwaukee Railroad, was accepted by General Manager Harley A. Johnson, who told of the methods adopted for increasing the schedule speed without raising the maximum speed.

Installation of the new officers was the closing formality of the convention, following the report of the resolutions committee.

Discussions at the Lunch Table

Specific topics considered at fourteen round-table conferences prove of interest to many of the delegates

A SERIES of round-table luncheons was a feature of the Cleveland convention. Fourteen were held under the auspices of the American Association in addition to the several luncheons conducted at the noon hour by the several affiliated associations. Of the American Association luncheons, six were held on Tuesday, seven on Wednesday, one on Thursday and one on Friday. A brief account of those held on the first three days follows:

No. 1 was devoted to traffic regulation.

It was brought out that there is a marked tendency to install traffic control lights without regard for the conditions under which they are to operate. The bad results of this practice in various cities were mentioned by a number of speakers. Others emphasized the importance of railways assuming leadership in solving traffic problems.

Taxes were considered at luncheon No. 2. Most of the information developed at the meeting related to the taxing practice of different states on public utility properties, particularly electric railways. While no attempt was made to obtain any general consensus of opinion, the thought was expressed by several of the speakers that a gross or gross-net tax was simpler to determine and had the advantage usually of requiring a smaller number of tax boards.

Luncheon No. 3 was on the motor bus and was largely

an experience meeting in which representatives from Louisville, Youngstown, Los Angeles and other cities gave their experiences.

The subject discussed at luncheon No. 4 was trend in franchises. One company said its difficulties on a new franchise were solved when it induced a group of representative citizens to investigate its situation and make recommendations.

At luncheon No. 5, on developing sales instinct in platform employees, the possibilities in this direction were brought out by the experience of several companies.

Luncheon No. 6, on advertising, was attended by more than 100 delegates and there was an exchange of ideas on the best means of selling car and bus rides.

The popularity of the round-table luncheons at the Cleveland convention assures their retention as a feature next year. On Wednesday the American Association held six more of these informal meetings at which delegates were able to exchange experiences without loss of time. So many registrations were received for some of these luncheons that two rooms instead of one had to be engaged. When the discussion took place, however, all of the diners came together in one room.

This was the case with luncheon No. 7, on the subject of cars. In it the actual experience testimony of men who have carried out car improvement programs piled up convincing evidence of the growing acceptance by the industry of the importance of improved cars as the key stone of the entire service improvement program for electric railways. Several examples were cited of properties which had first started on a small scale with the remodeling of older equipment and had gradually expanded its program to the purchase of new cars of the most modern types available. Representatives of several large properties at the luncheon said that they were only awaiting demonstration of the proper types of equipment to be used before entering upon extensive replacement programs. There seemed to be no question in any one's mind but that the present car exhibit had demonstrated in no uncertain way the possibilities in developing cars that can compete successfully with the private automobile under modern traffic conditions.

Methods of new financing and refinancing of electric railway properties was the subject of luncheon No. 8. It was presided over by President-Elect Stevens. He opened the meeting by calling attention to the report of the advisory committee on electric railway finance, presented to the association in 1925. In this report it was recommended that where necessary to revise the financial structure, arrangements should be made to do it voluntarily without the necessity for a receivership. There are some properties, he explained, that cannot be made successful. The sooner this is admitted and they are eliminated, the better the general railway situation will be. L. S. Storrs pointed out that the better the earnings the lower the interest rate that can be obtained. Some question was raised as to why the senior security holders should be made to suffer rather than the junior. It was brought out that the junior holders will suffer in any event where a reorganization of the capital structure is necessary.

"Get your house in order," "sell your employees before you try to sell your public"—such were the rallying cries of the public relations luncheon (No. 9). Thomas Fitzgerald of Pittsburgh in opening this discussion mentioned briefly the policy of his company not to punish employees and not to allow any hint of compulsion to



Leaders at the Luncheon Conferences



1. L. R. Nash
2. E. I. Buid
3. L. J. Desmarais
4. L. H. Palmer
5. H. B. Fawcett
6. W. E. Wood
7. G. H. Clifford
8. T. Fitzgerald, Jr.
9. T. Conway, Jr.
10. Edward Pana
11. F. W. Donahue
12. Leslie Vickers



enter the company's dealings with the public. Careful employee education and a fair attitude toward the city and the riding public are held by him to be more effective policies than would be heavy-handed methods. R. B. Stearns of Boston outlined briefly the "home rule committee" plan which the Eastern Massachusetts street railway evolved for improving public relations in the various communities which it serves. Fred Cummings of the same company expressed the belief that every company should have a good newspaper man in charge of its public relations, a man with courage enough to stand up to the railway executives and tell them when he believes their attitude to be wrong, even at the risk of sacrificing his own head. John Davies of Philadelphia spoke of the comprehensive plan of employee-employer co-operation which has been worked out in Philadelphia, resulting in a company sales force numbering 12,000 enthusiastic individuals. Adrian Hughes, Jr., of Baltimore mentioned the fact that his company has one employee for every 200 citizens in Baltimore, the obvious inference being that when each employee takes upon himself a responsibility for the company's public relations splendid city-wide coverage results. Other speakers told of good results in Houston and Fort Worth, Tex. The problem of interurban public relations was discussed by Mr. Allenson. He described the experience of his own company with the interurban line between Fort Worth

and Dallas and pointed out that first-class equipment and service will do more for good public relations than anything else within the power of the company to accomplish.

More than 100 attended luncheon No. 10, on city service, many telling how the replacement of old cars with new or modernized cars, increased speed and additional comforts had resulted in increased patronage and greater friendship for the utility on the part of the public. Chicago improved service has been obtained in speeding up street cars by co-operation with municipal authorities and other affected interests through a successful plan for street traffic control. This has enabled the speed of the street cars in Chicago to be increased to an average of 11.02 m.p.h. Other experiences along somewhat similar lines from Atlanta, Detroit, Kansas City and St. Louis were cited.

At the valuation luncheon, No. 11, the discussion centered particularly on the fundamental difference between historical value and cost of reproduction value. One of the intangibles that seemed to bother all representatives present was going value. Courts have ruled that some allowance must be made for this, but no rule for arriving at it have been given. The problems of each utility seemed to require separate solution so that a method used on one property is not applicable to another.

At luncheon No. 12 it was declared that the trend of fares was still upward despite the difficulty in securing decreases, the dangers of making fares too high and the effect of changing fare rates on public opinion. Many interesting facts on various types of fare were mentioned, and means of attracting off-peak traffic at reduced rates and educating the public as to the need of higher fares with better service received considerable attention.

Luncheon No. 13 was devoted to employee relations, and accounts were given of the practice in discipline, pensions, benefit associations, etc. It developed that the benefit association in Milwaukee, composed of more than 500 employees, handles its own life, health and accident insurance, operates a building, savings and loan association and handles matters of safety, service and every other feature affecting its membership. The association also has more than \$500,000 invested in good securities, and its members have more than \$9,000,000 invested in their own building and loan stock. Through this association 3,500 employees have been able to purchase or build their own homes.

Under the sponsorship of Dr. Thomas Conway, Jr., president of the Cincinnati, Hamilton & Dayton Railway, the luncheon meeting on Thursday, devoted to the general subject of interurban railways, provoked a spirited discussion of many phases of the intercity problem. B. J. Flon, speaking for the group of Insull owned high-speed electric lines radiating out of Chicago, declared that the large increase in the travel habit between cities offers interurbans a greater prospect for business, provided that the proper kind of service and selling initiative can be developed. As an example he cited the experience of the Chicago, South Shore & South Bend Railroad, which has shown an increase of 150 per cent in its business following an extensive program of rehabilitation and intensive merchandising.

J. W. Pontius said that the Pacific Electric Railway is about to spend more than \$1,000,000 for improved seats and better facilities for its passengers in the effort to compete more successfully with the privately owned automobile. W. H. Burke testified to the effectiveness of higher speeds and remodeled cars by citing the experience of the Galveston-Houston Electric Company in successfully competing for business.

Freight revenue was held by many of the executives present to afford opportunity for the development of additional business. Freight earnings by the Interstate Public Service Company, according to L. M. Brown, have more than offset the decrease experienced in passenger business. H. A. Nicholl expressed the opinion, based on the experience of the Union Traction Company of Indiana, that interurbans must ultimately go to pick up and delivery of freight in one form or another to meet truck competition. J. M. Bamberger announced that the Bamberger Electric Railway had just started a pick up and delivery service at each end of its line, at regular trucking rates in that territory. He considered delivery of even more importance than pick up in the eyes of shippers.

The discussion of the proper type and size of passenger equipment for interurban service led to differences of opinion which occupied attention during the balance of the meeting. This discussion revolved around the relative advantages and safety of heavy and light equipment in high speed service. Dr. Conway summarized the situation by suggesting that interurban equipment divides

itself into various classes depending upon the nature and characteristics of the line and service.

In addition to these luncheons, similar gatherings were held by the Accountants, Claims and Engineering Associations on Wednesday. References to them will be found on other pages of this issue.

Maintenance in the Limelight at Cleveland

Journal prizes awarded at dinner during convention. Prominent executives emphasize importance of maintenance men's part in popularizing electric railway service



W. T. Rossell

Who spoke at the Maintenance Dinner in Cleveland on Oct. 2

"SPEED, convenience, comfort, safety, economy—these are what the times demand. No inconsiderable part in the achievement of these things rests upon the maintenance man. He finds himself always between two opposing forces, improvement and economy. One without the other is easy; together, they test him. The balance that creates the greatest use is the end sought."

With these words, W. T. Rossell, general manager Pittsburgh Railways, characterized the problem of the maintenance man at a dinner held at the Hollenden Hotel on the evening of Oct. 2, when the four annual prizes awarded in the ELECTRIC RAILWAY JOURNAL's maintenance contest were presented to the winners.

Three of these winners were able to be present. They were James A. Duffy, superintendent of equipment Monongahela West Penn Public Service Company, who received the first prize of \$200; Joseph Mercier, general foreman track service division, Montreal Tramways, who received the second prize of \$100, and E. M. Miley, estimating engineer Chicago Surface Lines, who received the fourth prize of \$25. The winner of the third prize, \$50, Charles Hermes, general foreman San Diego Electric Railway, was not able to be present, but the prize and a certificate of award were handed later to representatives of his company who were at the convention, for transmission to Mr. Hermes.

100 MEN INTERESTED IN MAINTENANCE PRESENT

Besides the prize winners and judges in the contest, those in attendance at the dinner included about 100 other representative delegates to the convention who are especially interested in maintenance problems. Those at the head table, besides Charles Gordon, editor of ELECTRIC RAILWAY JOURNAL, who acted as the chairman, were President W. H. Sawyer and Managing Director L. S. Storrs of the American Electric Railway Association; Daniel Durie and R. H. Dagleish, the retiring president and the incoming president of the Engineering Association; W. H. McAloney, president Association of Equipment Men, Southern Properties; P. V. C. See, past-president Central Electric Railway Master Me-

A Message to the Association

THE WHITE HOUSE
WASHINGTON, D. C., SEPT. 30, 1927

WILLITS H. SAWYER,
American Electric Railway Association,
Cleveland, Ohio.

I hope your convention will be most successful in furthering the cause of transportation so vital to the welfare of our people. Any progress in solving the real problems presented by modern conditions is a service to all. Please present my greetings and best wishes to your members and your guests.

Calvin Coolidge.

chanics Association; W. T. Rossell, general manager Pittsburgh Railways; A. T. Clark, superintendent of rolling stock and shops United Railways & Electric Company, Baltimore, and chairman of the committee of judges in the contest. The other members of the committee of judges, F. McVittie, electrical engineer New York State Railways; Howard H. George, assistant to chief engineer Public Service Production Company, and G. C. Hecker, special engineer American Electric Railway Association, were present as were also prominent railway and manufacturing executives.

The prizes were presented individually by Mr. Clark, chairman of the committee of judges, who declared that the purpose of the contest was to bring about a greater interchange of ideas between maintenance men and thus to raise the level of maintenance practice in the industry. In referring to these contests, he said:

"Since the men who are responsible for keeping cars, tracks and lines in efficient operating condition are inclined to be overmodest and reticent in taking the initiative toward publishing the improvements which they have found effective in saving labor or cost, this plan of posting prizes for such items was a very desirable and helpful one. The unusual publicity given to those items which were awarded prizes should also tend to break down the tendency on the part of maintenance men not to utilize in their own work an idea developed by the fellow on another property. In at least one instance a maintenance idea which was awarded one of the monthly prizes was quickly adopted by a large truck manufacturer and made a part of his standard equipment."

Mr. Clark explained that the members of the committee of Judges had been appointed by President Durie of the Engineering Association to represent different departments of maintenance work. He also explained the care used by the judges in naming the prize winners. In conclusion, he said:

"The board of judges desires to commend the action of the ELECTRIC RAILWAY JOURNAL for establishing these interesting contests. It is their belief that excellent benefit to the electric railway industry will result from the broadcasting through the railways of these various items and will stimulate those who would ordinarily give little thought to publishing their wrinkles to produce items of even greater benefit and more use to the many interested in electric railway companies."

Mr. Gordon, acting as chairman, pointed out that while the purpose of the meeting primarily was to award the prizes, the JOURNAL hoped thereby also to inspire in the

maintenance men of the industry a broader vision of the part they play in popularizing electric railway service, to stimulate more interest in maintenance on the part of the railway executives and to encourage further developments of equipment and machinery through the introduction of these new devices to the manufacturers.

PROMINENT EXECUTIVES SPEAK

The railway executives who spoke at the dinner included Messrs. Sawyers, Storrs, Rossell, McAloney and See. All emphasized, though from different angles, the important part played by the maintenance man in popularizing electric railway service. Mr. McAloney said: "The street car is the show window of the industry, and unless the car is well maintained, clean, attractively painted and mechanically capable of operating with a minimum of failures, all the other efforts to popularize the service will fail."

Mr. Rossell, in addition to the remarks contained in the first paragraph of this article, said, in part:

"To me the significance of this maintenance contest is not the mere improvement in method in connection with a few operations. It is far deeper than that. It shows the alertness of mind, the enthusiasm and adaptability of the individuals. Formerly an attitude of mind seemed to exist based on the axiom, 'Never explain anything, your friends don't need it and your enemies won't believe it.' This attitude is breaking down. Everywhere men are traveling about to find out what others are doing. Everywhere men are explaining and showing their most cherished plans and methods. There is no property on which the visitor cannot learn something worth while. The harvest is waiting for the sickle."

Clarence W. Squier of the ELECTRIC RAILWAY JOURNAL staff, also spoke and showed slides of the apparatus which won the prizes. He explained the purpose and advantage of these devices. He also showed slides of other equipment entered in the annual and monthly maintenance contests.

Educational Conference Held Friday

THE final event on the program of the Cleveland convention was the educational luncheon and conference, held Friday at the Hollenden Hotel. Edward Dana, Boston, chairman of the American committee on education, was sponsor for the conference, and it was held under the leadership of Arthur J. Rowland, Milwaukee.

The principal subject discussed was systems for training platform men and bus operators. Experience quoted at the meeting was that following an extended course of this kind on one road, there had been a 70 per cent reduction in accidents, 10 per cent in labor turnover and 20 per cent in claims cases. The course is divided into three general divisions, i.e.: (1) The school training, (2) road training and (3) instruction in equipment details.

It was found that all the roads represented at the conference give special attention to the instruction of one-man operators, and they considered that freight operation adds many problems to the operating course.

The difficulty of modernizing the ideas of some of the older employees was mentioned as a considerable problem by some of those present. Many excellent methods used to select members of the supervisory force were also brought out at the meeting.

Improved Methods and Equipment Needed, Say Engineers

Ways of producing economical maintenance discussed. Power economies result from use of automatic substations. Motor coach design an added problem. Commercial aviation a new field. Committee reports show progress made

ECONOMY was the general subject of papers and discussions at the first day's session of the Engineering Association. That these problems are receiving much attention was evident. The general impression given was that improved methods and better equipment provide the surest road to ultimate maintenance economies and that although costs at the start may appear high, the ultimate results are the important ones to be considered. Improvements to railway cars, trucks, overhead and power supply are entirely up to the engineers and maintenance forces. That these problems are receiving much attention was evident.

In his address as retiring president of the Engineering Association, Daniel Durie stated that many changes have taken place in our industry during the past decade. Of design, weight reduction, one-man operation, higher accelerating and braking rates, higher speeds, reduction of noise, improved appearance of car bodies, scientific lighting and increased comforts and conveniences for passengers are among the important developments.

In the power field, the automatic substation is a development which has influenced greatly the design and operation of substations. Now comes the mercury arc rectifier, which may have a marked influence on present practices in power conversion and distribution.

All of you are familiar with the developments that have taken place in the construction and maintenance of tracks. The use of labor-saving machinery and modern methods of track construction and maintenance, together with the application of welding to rail joints, has brought great changes in this branch of our work.

The motor bus brings an entirely new set of engineering problems to be solved, and aerial transportation is being talked of. Perhaps our next set of problems will come in connection with the design, operation and maintenance of airplanes. The significant aspect of all these developments is the changed status of the electric railway business. The obligation to furnish any and all kinds of public transportation in our communities falls squarely upon the shoulders of the established transportation industry. This was held to broaden the field of activity for the electric railway engineer, and to open up greater opportunities ahead for those who can measure up to the job.

The association has been active through its committees and its staff at headquarters in gathering and disseminating information, in establishing good practices and in developing standards for use by the industry. Research work in several fields has been carried on under committee supervision to develop data for the advance of the art and to effect economies. The association is the agency through which the industry expresses its views



J. G. Barry and W. B. Potter

and safeguards its interests in national standardization and in joint studies and investigations with other national groups.

The activities of the association have been expanding due to changed conditions and to the impetus given to national standardization and simplification through the work of the American Engineering Standards Committee and the Division of Simplified Practice of the Department of Commerce. This has necessitated a complete change of the association's committee structure in order that more men might be enlisted in the study of the ever-increasing engineering problems and in the development of improved practices and better standards. The new committee system will be completed during the next year. It appears to possess many advantages over the old system, but the executive committee is not yet entirely satisfied with the results and is striving constantly to improve the plan.

In recent years there has been too little time for the presentation and discussion of committee reports and there has been no time at all for papers and discussions of general interest. A new plan is being tried this year which the officers believe will greatly enhance the value of the meetings. This plan provides for group meetings to be held simultaneously, one for the rolling stock division, one for the way and structures division, one for the power division and one for the purchases and stores division. All committee reports will be presented and discussed at those group meetings and all necessary committee business transacted.

Another matter to which the executive committee has given considerable thought is that of promoting wider

use of the association's standards and recommendations. Obviously the maximum benefits and economies of standardization can be realized only when such standards become generally accepted. Some of our present standards are quite widely accepted today. Others, however, are not used very extensively and the executive committee is seeking the reason for this in the hope that our entire program of standardization can be made of greater value to the industry. Committee members can help in this problem by using our standards and recommendations and by urging others to use them.

Track, Cars and Power

A paper on each of these subjects was presented at the Monday afternoon session

IN A paper on track construction and maintenance economies, F. B. Walker, chief engineer Eastern Massachusetts Street Railway, showed charts to indicate the amounts of track reconstructed, progress by years, derailments and costs in a rehabilitation program of his company. He also described a base plate joint construction used on his system. This paper is published in abstract elsewhere in this issue.

W. H. Sawyer, president of the American Association, spoke briefly and emphasized the need for recognizing the human element in all engineering work, instead of insisting that things be mechanically perfect. He said that the convention speaks for itself; it is the biggest and best ever held, but what are we going to do about it? Everyone is sure to go home with a thrill and with new pride in the work that they are doing and with the fact that they are electric railway men. Mr. Sawyer emphasized, however, that the job is just beginning. Engineers must work out the foundation on which to build for a better future.

"Economies Obtained with Modern Cars" was the title of a paper presented by W. R. McRae, superintendent rolling stocks and shops Toronto Transportation Commission. This paper brought out the thought that attractive cars are not sufficient. Maintenance methods must be improved and as a result costs will decrease. Mr. McRae described the modernization program as carried out by his company and spoke of maintenance improvements, cars, shops, track, line, record systems and new tools used. Results showed that this elaborate program has paid far beyond expectations and that modernization, if properly carried out, will convert a deficit into a surplus. A more extended abstract will be found on another page of this issue.

Discussion of this paper brought out that increased attention to the modernization of all maintenance departments eventually results in economies and also a reduced attention to service and creates a better feeling toward the railway by its patronage. Two of the speakers indicated that managements of some railways appear to be forcing maintenance departments to give too great attention to the reduction of costs instead of insisting on improved maintenance methods and use of better and more modern equipment for the work. If railways are to continue to exist, this attitude must change.

The concluding paper of the first session was on "Automatic Substation Economies," by W. E. Bryan, superintendent of power United Railways of St. Louis. This described how automatic substations are constructed

in St. Louis and showed that a large saving has resulted over operation with manual stations. This paper is also abstracted elsewhere in this issue.

Committee Reports Presented

Way and Structures, Rolling Stock, and Power Divisions Hold Separate Meetings

THE second day's meetings of the Engineering Association were devoted to committee reports. To facilitate presentation of these three simultaneous sessions were held. The first was devoted to reports of the way and structures division, the second to the rolling stock committee reports and the third to power reports.

WAY AND STRUCTURES DIVISION

Evidence of the extent to which track and roadway officials are studying the problems of their department of electric railway service was given in the quality and variety of reports presented at the meeting of the way and structures division of the A.E.R.E.A. on Tuesday. H. H. George, chairman of the committee and assistant to the chief engineer Public Service Production Company, Newark, N. J., presided and presented the report of the main committee. W. W. Wysor, chief engineer of the United Railways & Electric Company of Baltimore, was sponsor of the meeting. The interest of the members in the work of the division was shown by an attendance of 150 engineers and construction men.

In addition to the technical reports and discussions, a brief talk was made by Lucius S. Storrs, managing director of the A.E.R.E.A., in which he pointed out the important part good track construction and maintenance plays in good transportation.

"The best and cheapest investment a railway can make is good track. Smooth tracks are a necessity in this day, when the automobile with its pneumatic tires has taught the public to demand comfortable, easy-riding transportation," Mr. Storrs said.

In addition to the report of the committee on way and structures by Chairman George, two other regular committees reported. C. A. Smith, superintendent of roadway, Georgia Power Company, Atlanta, as chairman of the committee on road preservation filed the committee's report recommending several changes in the manual. He stated that the committee considered the major part of its work had been completed and recommended that it be discontinued as an independent committee, the industry to be kept advised of new developments in the future by a special committee of the division. A more extended abstract of this report will be found elsewhere in this issue. E. M. T. Ryder, way engineer Third Avenue Railway System, New York City, made a brief verbal report telling of the studies being made under the direction of the committee on welded rail joints.

Reports also were filed by a number of special committees. The report of the committee on rail corrugation was made by D. D. Ewing, professor of electric railway engineering, Purdue University. The variety of problems involved in this subject was indicated when Professor Ewing stated that "everything between the trolley wire and 10 ft. under the track" might be a contributing factor in this mysterious cause of damage to rail. Further particulars of this report appear on another page.



Left, A. T. Clark and W. W. Wysor; right, Terence Scullen

An interesting paper on corrugation was presented by E. O. Ackerman, maintenance of way engineer Columbus (Ohio) Railway, Power & Light Company. Mr. Ackerman told of his studies over a period of years and advanced the theory that corrugation was caused by synchronization of pulsating flow of power with tort vibration of axle and wheels, these vibrations becoming cumulative at certain speeds of the vehicle and causing corrugation.

W. R. Dunham, Jr., executive engineer Department of Street Railways, Detroit, made the report of the special committee on review of Manual. He suggested that in the section of the Manual W. 108-23 Rivets there should be a revision of paragraph 503 to read as follows:

"Rivets shall be of full diameter called for on plans, and rivet holes shall not be more than $\frac{1}{8}$ in. greater in diameter. When not otherwise called for by plans or specifications, rivets shall have standard button or cone heads of uniform size for the same size rivet. Countersunk rivets shall be flush with the surface and fill the countersink except that the rivets through base and tie plates may have a crown of not more than $\frac{1}{8}$ in. below the surface of the plate."

E. M. T. Ryder, Third Avenue Railway, read the report of the committee on special track work. It referred particularly to switch tongues and hard centers and is given in abstract elsewhere in this issue.

Arc-welding processes and welding rod specifications were reported on by C. F. Gailor, of New York, chairman of this special committee. This report was based on a very thorough study, and the committee says it believes the report represents the most reliable and up-to-date information possible to secure at the present time. It contained a set of rules to be observed in arc welding, a set of welding rule specifications, both contained in appendices which the committee recommended should be published for general distribution. The committee also recommended that further study be made of the subject, particularly of the cost of welding rods, comparison of welding rods and use of special alloy rods.

A. T. Spencer, general superintendent of construction and maintenance Montreal Tramways Company, gave the report on alloy steels other than manganese for special trackwork, and light section girder rails were reported on by C. A. Alden, chief engineer of the frog and switch division of the Bethlehem Steel Company. Further discussion of rails was contained in the report of the special committee on relative advantages of 7- and 9-in. girder rails, which was given by H. F. Merker, chief engineer way and structures Brooklyn City Railroad.

A. E. Harvey, superintendent construction department Kansas City Public Service Company, reported on the effect of modern vehicular traffic on paving in the track area, giving special attention to the effect of increasing loads carried by rubber-tired vehicles in breaking down paving subgrade.

Other track matters were discussed in the report on track ballast and drainage delivered by S. C. Baker, engineer maintenance of way East St. Louis Railway Company, and on track construction specifications by C. L. Hawkins, engineer maintenance of way United Railways of St. Louis. C. H. Clark, engineer maintenance of way Cleveland Railway Company, offered in lieu of a written report on track checking gage two gages designed for this purpose by his committee.

J. R. McKay, chief engineer Indiana Public Service Corporation, Fort Wayne, gave the report on bus garage design and told of work that has been done in co-operation with the National Fire Protection Association in an effort to arrive at acceptable construction specifications.

H. E. Bachman, of Newark, chairman of the special committee on car house and shop construction and wiring regulations, was unable to attend the meeting and no formal report was made. Chairman George stated that the committee on joint railway and bus terminals had been inactive during the year and announced the appointment of E. D. Eckroad, engineer maintenance of way northern Ohio Power & Light Company, Akron, as chairman for the coming year.

ROLLING STOCK DIVISION

Assuming that the amount of discussion is an indication of relative interest, it appears that modern cars, car lighting and noise reduction are the live subjects in the rolling stock division. Thirteen special reports and three general reports were presented at the session, abstracts of which appear elsewhere in this issue. In the progress report on suction strainers for air compressors J. C. McCune, chairman, urged that greater attention be given to suction strainer maintenance. The report contained descriptions of some late type designs.

The committee on sidewear of motor brushes reported progress and recommended a continuation of its study. The special committee on gearing reported that no conclusions could be arrived at regarding relative merits of helical and spur gears.

The committee on overhead current collecting devices presented two sets of graphs, one plotted from information secured by previous committees and the other from data obtained from this year's committee. These graphs showed companies arranged in order of their wheel life, and the outside diameter of the wheel used and trolley pole tension were plotted for these companies. The graphs were very similar in wheel life, but the 1927 data show a wide variation in trolley wheel pressure against the wire. They also show a more uniform diameter for wheels used.

POWER DIVISION

At the meeting of the power division of the Engineering Association held Tuesday, Oct. 4, two important committee reports were read and discussed.

The first, on power transmission and distribution, was read by Chairman F. McVittie, electrical engineer New York State Railways, Rochester, N. Y. The particular subjects covered in this report were specifications for catenary construction and materials, trolley wire wear, improving specifications for bronze trolley wire, radio

interference, inductive co-ordination and design of distribution layout for automatic substations. The advisability of establishing a standard for comparing methods of operating and maintaining overhead lines and the standardization of trolley wire reels were also treated. A design of suspension for contact car and a specification for standard bronze trolley wire were reported as having been adopted by the standards committee. Further details of this report are published on another page.

The committee on power generation and conversion, W. E. Bryan, superintendent of power, the United Railways of St. Louis, chairman, had three specific subjects to report on: The ventilation of automatic substations, mercury arc rectifiers and economical trolley potential for congested districts of urban systems. The ventilation report included the results of an intensive three-year study on this subject. Other valuable information was given by W. E. Peters, C. A. Butcher and Pierre Blommers. The mercury arc rectifier report stated that no method of rating had as yet been agreed upon. Data on some rectifier installations were given by O. K. Marti. Results of tests on trolley potentials for congested districts were given. The economies effected by the use of certain voltages under various conditions were included in the report, of which further details are given on another page.

General Meeting Thursday

Motor coach engineering, overhead line maintenance, and aviation discussed

MOTOR coach design, overhead line maintenance and commercial aviation formed a varied program for the third and concluding session of the Engineering Association. The paper by H. D. Church, director of engineering White Motor Company, on trends in motor coach engineering brought out discussion as to developments that will provide greater accessibility of parts so that maintenance operations can be carried out cheaper and with less trouble. Light-weight construction through the use of aluminum or other light-weight materials appears as one development that will be watched closely. In answer to a question "Why Use Four Speed Gearing?" discussion showed that the speed steps of gearing for buses is determined usually by the worst conditions encountered.

New developments were referred to by Carl Stocks, editor of *Bus Transportation*. "An interesting feature," he said, "is the tendency toward automotive street cars on rubber tires. In the early days the automobile note was predominant in bus service. Engine location, lines of body, position of driver, all had to copy the private automobile as far as could be done with the much larger vehicle, or, at least, so it was thought. Now comes a new movement worthy of close study. Is the public concerned merely with getting somewhere as soon as possible regardless of the appearance of the vehicle, or has past favoring of the automobile type of vehicle had anything to do with the popularity of the bus?"

Maintenance of a large overhead system was discussed in a paper by M. W. Cook, superintendent of power and inclines Pittsburgh Railways, in which stress was laid on the great value of efficient overhead maintenance. Discussion brought out that proper organization to reduce detentions is most vital. Various speakers described things they are doing along this line.

The latest form of transportation, that by airplanes, was discussed in a paper, "General Aspects of Commercial Aviation," by R. H. Horton, former vice-president Philadelphia Rapid Transit Air Service. Mr. Horton traced the development of commercial air services since the war. Much of the progress has been in the mail service. He pointed out the dependability of this, and suggested that a method of payment be adopted that will more equitably compensate the carriers for the service rendered. Passenger air transport he holds to be one of the most important fields for development, although it has been sadly neglected.

The closing business of the session included the installation of newly-elected officers and the presentation of a past-president's badge to Daniel Durie, retiring president.

Conference on Welded Rail Joints

EXTENSIVE investigations by scientists and practical engineers conducted during the past year under the direction of the committee on welded rail joints of the Engineering Association were described at a meeting of the committee on the lower floor of the Auditorium Wednesday morning.

E. M. T. Ryder, way engineer Third Avenue Railway System, New York City, and vice-chairman of the committee, presided. Mr. Ryder stated that the committee which is a joint committee of the A.E.R.A. and of the American Bureau of Welding, a research department of the American Welding Society, had outlined a series of investigations to determine the best type, size, shape and seam of welded joints, the effects of preheating and post-heating, the comparative advantages of use and non-use of base plates and the advantages of contact or compression of the joint. One hundred and fifty joints will be made up for these tests, and Mr. Ryder stated that approximately one-fourth of this number had been made up during the past year and turned over to scientific investigators.

Prof. H. L. Whittemore, chief of the division of mechanics, U. S. Bureau of Standards, Washington, described and presented charts showing the results of tele-meter investigations into the effects of impact loads and static loads. O. S. Peters, also of the Bureau of Standards and an associate of Professor Whittemore in these studies, was scheduled also to speak but was unable to be present.

"Strain gage" investigations to determine the strains on seam-welded rails resulting only from the process of welding were described by Prof. L. H. Crook, of the department of mechanics, Catholic University, Washington. Studies along a similar line have been made during the year by Prof. Thomas R. Lawson, of Rensselaer Polytechnic Institute, Troy, N. Y., who told the committee about them.

W. W. Wysor, chief engineer United Railways & Electric Company of Baltimore, was in charge of a third series of experiments on the effect of "Impact on Joint Without Fishing Contact," and these were described by R. B. Fehr, of the Una Welding & Bonding Company, Cleveland, under whose direction the tests were conducted.

J. Wolfe, assistant superintendent of track and road way Chicago Surface Lines, was elected a member of the executive committee, succeeding E. J. McIlraith, staff engineer of the same company, resigned.

Standard Tongue Switch Indorsed

AT THE Engineering round-table luncheon on Wednesday emphatic approval of the new proposed standard solid manganese steel tongue switch was voiced by way engineers from all sections of the country. Drawings of the suggested design were distributed by E. M. T. Ryder, who sponsored the meeting and called for expressions of opinion. It was generally agreed that many advantages can be had by standardization of switches and that the proposed design meets the needs of the situation. Some doubt was expressed as to whether a 6-in. riser was sufficiently long. This matter will receive further consideration by the committee.

Representatives of special trackwork manufacturers stated that the standard switch could be supplied at the same cost as designs now used. Practically every engineer who was present agreed to install one or more of the new switches during the next year for experimental purposes.

Better Buying and Storekeeping May Help Industry's Finances

PURCHASING agents and storekeepers who attended the meeting of the purchasing and stores division on the afternoon of Tuesday, Oct. 4, were not left in any doubt concerning their rôle in the present-day transportation drama. They were told in no uncertain terms by President W. H. Sawyer, Lucius Storrs and B. J. Yungbluth, president of the International Railway Company, Buffalo, N. Y., that they were the "watch-dogs of the money drawer"; that the financial stability of the electric railway industry depends, in large measure, upon their unceasing efforts to wipe out waste expenditures.

SHOULD WIDEN THEIR SCOPE

Time after time the thought was advanced by the various speakers that purchasing agents and storekeepers, far from being mere routine cogs in an organization, should ever be widening their scope and becoming familiar with the activities of all departments in their respective companies. In this way these men become competent to assume a large share of the responsibility for coordinating more completely the work of their depart-

ments with that of the remainder of the organization. By reducing the investment in materials on hand, more money is released in the "cash drawer" of the industry.

Greeted cordially by Daniel Durie, president of the American Electric Railway Engineering Association, and presided over by J. Fleming, assistant secretary and purchasing agent of the Capital Traction Company, Washington, D. C., and chairman of the committee on purchases and stores, those in attendance were unanimous in their feeling that the afternoon was a most profitable one.

J. G. Barry, vice-president of the General Electric Company, discussed the possibilities of further standardization of equipment and urged that operating companies improve their own financial condition by adopting, as far as is consistently possible, the standards that have been established by manufacturers and by the American Electric Railway Engineering Association. This would make quantity production possible to a much greater degree than is now the case and would benefit materially both operating companies and manufacturers.

Mr. Barry also suggested that a real source of saving would be found in a reduction of the number of separate orders sent to manufacturers by railway purchasing departments. A number of small orders consolidated on one sheet will cut down amazingly the amount of "paper work" by both buyer and seller. This reduction will mean savings, not of hundreds but of thousands of dollars a year to the railways, in the opinion of Mr. Barry.

Mr. Yungbluth, in emphasizing his point that the investment in materials on hand be kept as low as possible, cited the "horrible example" of one large company about two years ago which had more than \$100,000 worth of special work on hand which had never been used and for which there was no immediate likelihood of a demand. At the time, the financial condition of this company was very dubious and it could ill afford this needless tying up of capital.

"Some Phases of Stores Practice" was the title of a talk by W. E. Scott, superintendent of supplies for the Philadelphia Rapid Transit Company. Mr. Scott has been active in the work of the committee on purchases and stores since its establishment in 1923, and he outlined in interesting fashion some of the accomplishments of this group since that time, mentioning particularly the effectiveness of the stock-book plan, adopted in the year 1923.

MR. FLEMING READS REPORT

The report of the committee on purchases and stores for 1927 was read by Mr. Fleming and was adopted in its entirety by the members of the division. An abstract appears elsewhere in this issue. Particular attention was called to the simplified invoice form mentioned on page 12 of the report, and the division voted favorably on the committee's recommendation that this simplified invoice form be indorsed by the American Electric Railway Association.

An added note of interest in the meeting was given by the unexpected attendance of both Mr. Sawyer and Mr. Storrs. These men spoke from their own experience as operating executives in stressing the importance of purchasing agents and storekeepers in the progressive forward movement of the transportation industry. In other words, these jobs are as big as the men that fill them.

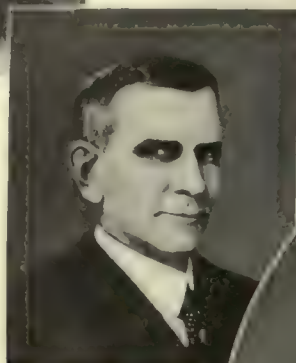


Ed Meissner receives Anna Case in the St. Louis car exhibit

Newly Elected Officers of the American Electric Railway Association



J. P. BARNES
*First
Vice-President*



PAUL SHOUP
*Second
Vice-President*



R. P. STEVENS
President



J. H. HANNA
*Third
Vice-President*



C. E. MORGAN
*Fourth
Vice-President*



BARRON COLLIER
Treasurer



J. W. WELSH
General Secretary

New Members of the Executive Committee



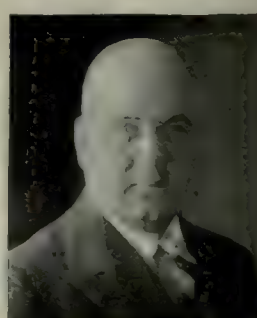
J. H. ALEXANDER



D. W. SNYDER, JR.



J. G. BARRY



W. F. CUTLER

T.&T. Plans for Increased Speed

Need for faster service emphasized at all meetings. Economies of bus operation and adoption of a uniform classification of accidents also discussed.

Edward Dana becomes new president

METHODS of increasing the speed of car operation constituted the theme of greatest interest at the meetings of the Transportation and Traffic Association. The first session was devoted to a discussion of bus operation and it was brought out that buses can often be used to advantage in conjunction with cars to provide more rapid service. Much of the work done by the committee on traffic and safety, whose report was considered at the second meeting, was in the direction of speeding up service. Again at the third meeting the same thought was emphasized in the discussion of service betterment.

Careful study of the recommendations of the various committees was urged by J. V. Sullivan, retiring president of the Transportation and Traffic Association, at the opening session. He said that the statement in the report of the committee on bus operation that 80 per cent of the railways studied feel that bus operation is justified, even though a much smaller percentage were able to report revenue sufficient to pay a return on their investment, is evidence of real courage and a determination to cry out what these operators feel is an obligation to serve their communities. An outstanding feature of the report of the committee on traffic and safety to which he called particular attention is a suggested outline of subjects to be studied in making a traffic survey. Latest developments in traffic signal control are also ably presented, he said. The only way to sell our product, according to Mr. Sullivan, is through service betterment which involves comfort, convenience and speed of transportation. It involves also making transportation vehicles more attractive in design as well as in color.

In conclusion, he urged men of the operating departments to engage more actively in association work. By engaging seriously and studiously in committee work men get a more intimate knowledge of its important problems.

Views on Bus Operation

Report of committee provokes discussion as to whether buses can be run at a profit

WHETHER or not bus operation is profitable was the subject of lively discussion at the Monday afternoon session. R. N. Graham, chairman, briefly summarized the report of the committee on bus operation. Commenting on the report, L. V. Tighe urged that study be made to discover means of operating buses more cheaply so as to furnish mass transportation at lower cost. A. J. Bosseau said he had never heard of a profitable A.E.R.A. bus operation, but this, he believes, is because the value of bus operation has not been correctly appraised. B. C. Cobb differed from this opinion. He stated, however, that bus transportation is essential and that it can be made profitable by proper adjustment of

service and fares. Garrett T. Seeley spoke of the indirect advantages of bus operation, such as smaller losses than would result from car operation under the same conditions. Combination bus and car service now being tried on Jefferson Avenue in Detroit was described by N. J. Shorn.

Experience in Cleveland with gas-electric and mechanical drive was discussed by M. W. Rew. He said that the gas-electric was more expensive, but possessed certain advantages in other ways. In the opinion of H. H. Hile it is desirable to keep the bus-operating personnel independent of the railway personnel, even though the services are co-ordinated. He emphasized also the importance of keeping bus weights down to a minimum. Care of tires was discussed by L. G. Fairbanks. A demonstration of the school of the Northern Ohio Power & Light Company for training bus operators was introduced by A. C. Blinn.

Lively Interest in Safety Work

Tuesday's joint session with Claims Association brings out need for careful analysis of accidents and their causes

PREVENTION of accidents was the subject of principal interest at the joint session of the T. & T. and Claims Associations on Tuesday afternoon. C. H. Even-son, co-chairman with H. K. Bennett, presented an outline of the work done during the year by the joint committee on traffic and safety.

Referring to the section of the report dealing with accidents N. W. Funk said that separation into chargeable and non-chargeable groups encourages trainmen to make greater efforts in safety work and explained the methods followed in Louisville. A similar opinion was voiced by William Paache, who stated that this separation had reduced accidents on the Chicago Surface Lines. Various changes were suggested by G. J. Kerwin in the present classification. George B. Anderson spoke of the desirability of adopting a uniform classification of accidents to permit comparison of what is being done on different railways. Lucius S. Storrs addressed the meeting briefly and emphasized the same point. D. L. Fennell said that recommendations for standardization had been made regularly and that the time had now come to take active steps to secure it. C. T. Boynton concurred in this opinion. J. V. Sullivan, presiding at the meeting, assured the members present that this matter would be taken up by the Claims Association. More attention should be given to the human element in safety work, according to A. J. Sarre. The need for whole-souled co-operation between management and men was stressed by J. P. Brown. The viewpoint of the Amalgamated Association of Street and Electric Railway Employees was presented by P. J. McGrath.

The report of the committee on bonus and award system was presented by G. T. Hellmuth. H. V. Drown explained the bonus system used by Public Service Railway.

Discussing traffic S. E. Emmons said that enough consideration is not being given by traffic regulatory authorities to the relative number of people carried by various vehicles. The tendency is to consider a street car and a private automobile as equally important from the traffic standpoint, whereas the car is really carrying many times more passengers. Making a traffic survey is not enough, in the opinion of M. R. Boylan. The real job is to secure the adoption of effective regulations. It is doubtful, he thought, whether it is desirable for the railways to take the lead in this matter. J. B. Stewart, Jr., said that traffic regulation is not a job for amateurs, but should be attempted only by experts after careful study.

Speed Essential for Service Betterment

Higher schedule speeds can be obtained by attention to details of operation. New officers installed at closing session

METHODS of speeding up electric railway service constituted the theme of the discussion at the Thursday afternoon session of the Transportation and Traffic Association. S. E. Emmons presented a brief résumé of the report of the committee on service betterment. He emphasized the fact that increasing the speed of car operation is the greatest need today.

Mr. Emmons also said that since the report of the committee had been printed a question had arisen concerning the definition of average speed as given therein. This was defined as being the figure obtained by dividing the total passenger car-miles by the total passenger car-hours, including lay-over time. Because some members objected to this definition, he suggested that the figure so obtained might be called operating efficiency rather than average speed. He stressed the point that such figures formed a better basis of comparison between companies than figures derived without including lay-over time.

C. H. Evenson stated that lay-over time should not be included in speed calculations. He expressed doubt concerning the desirability of making more frequent stops during the middle of the day than during the rush hour, as advocated in the report of the committee.

The dictionary states that speed is a rate of movement, according to E. J. McIlraith, and the committee cannot create a new meaning where speed is determined by the length of rest taken after the trip is over. However, it is quite possible and highly desirable to create a standard practice among members in determining speed.

The standard practice should be to class operating speed as the average rate of travel while operating. It can be obtained as a comparable figure from any company that pays proper attention to its scheduling.

Much damage is being done, he said, by misunderstandings as to street railway speed. For example, in Chicago it has been customary to report to the state commission crew pay-hours as car-hours for certain standard statistics, even though more than 11 per cent of the pay time is for time allowances outside of platform and terminal time. As a result the Chicago Surface Lines has been frequently represented as operating at a speed of less than

9 m.p.h. Bus operating and manufacturing officials have stated at commission hearings, before the City Council and in publications, that the street railway speed is below 9 m.p.h. They obtained that figure by dividing car-miles operated by crew pay-hours, which is no different in principle, Mr. McIlraith said, from what the committee proposes. Such tactics may some day be used against each railway operator, and unless he has a clean record of speed of operation that truly represents the meaning of speed, it may prove very embarrassing.

A contrary opinion concerning the value of speed was expressed by L. W. Heath, who thought that the average car rider is not so much interested in speed as in frequency and regularity of service. The attention which is now being paid to betterment of service marks a new era in the electric railway transportation industry, according to F. L. Butler. Speed is of paramount importance, he said. In Atlanta increased speed has not resulted in any increase in the number of accidents.

Increasing the rates of acceleration and braking is an effective way of increasing speed, according to J. C. Thirlwall. Use of track brakes and automotive type braking equipment are possible ways of accomplishing quicker retardation. He said that from an engineering point of view there was no reason why the street car should not excel all other vehicles in rapidity of acceleration and braking. An opposing opinion was expressed by E. J. McIlraith, who pointed out that the necessity of carrying standing passengers makes it impossible to accelerate and brake street cars as rapidly as automobiles. In his opinion, much time is now lost between the movement of the motorman's brake handle and the effective application of the brakeshoes to the wheels. Design should be improved to correct this situation, he thought.

George L. Kippenberger suggested that the best way for the electric railway industry to secure betterment of service would be for it to follow the example of Henry Ford and purchase modern equipment, even though this involved scrapping much expensive equipment that is not yet entirely worn out. W. T. Rossell mentioned the use of loading platforms as an effective means of increasing the speed of cars. These also tend to increase the speed of other vehicles using the streets.

Other phases of service betterment were brought out by A. J. Manson and J. J. Moran. Mr. Manson said that courtesy and tact on the part of trainmen are nearly as vital as speed. Mr. Moran suggested that trainmen be instructed to tell passengers the reason for delays.

After the discussion of service betterment, the report of the committee on resolutions was received and adopted. This included an appreciation for the work done by the officers of the association and the manufacturers in making the convention a success and an expression of the grief felt by the association on account of the death of E. M. Walker during the past year.

Edward Dana, the incoming president of the T. & T. Association, was escorted to the chair and made a brief address. He said that a meeting of the new executive committee had already been held and work of the association for the coming year would get under way within ten days. The meeting concluded with presentation of the past-president's badge to J. V. Sullivan.

Other new officers of the T. & T. Association for the coming year are W. H. Boyce, first vice-president; Samuel Riddle, second vice-president, and Paul Wilson, third vice-president. Members of the executive committee will be George B. Anderson, R. N. Graham, F. L. Butler and Richard Meriwether.

Accountants Bend Efforts to Solve Problems in Their Field

Reports and discussion show their earnest contribution to the advancement of accountancy in the industry. Referred to as the foundation stone of their organization. Bus accounting a subject of importance. T. B. MacRae was elected president

IN THE meetings of the American Electric Railway Accountants' Association at the Cleveland convention there was an impressive note that reflected the thought and earnestness that the accountants are devoting to a subject of vital importance to the electric railway and bus industry—accountancy. This body of men, referred to at one of the meetings as the foundation stone of their organization, are contributing to the science of railway accounting and endeavoring to solve the problems that arise in their field of work. A study of the reports of the various committees indicates not only the analytical student which the accountant of today is, but shows that he must have an essential grasp of all the details of the operations of his organization.

Bus accounting was the uppermost subject apparently in the minds of a number of the members of the association, although it was for the most part informally discussed. Many interesting and informative points were evolved.

At the meeting of the executive committee on Oct. 2, President L. E. Lippitt of the association, with the approval of the committee appointed E. H. Reed, third vice-president of the association and auditor of the Brooklyn City Railroad, the association's representative on the national joint committee on taxation.

The opening session was called to order on Monday afternoon in Accountants' Hall, Cleveland Auditorium, by President Lippitt and was followed immediately by his address. In this he reviewed some of the matters that had engaged the attention of the association during the past year, first calling attention to the committees that were appointed.

"Bus operation," he stated, "is playing a very important part in the transportation field. During the past year we have been working with some of the state commissions with the view in mind of having our classification adopted as a standard, and of course have met with some opposition. Nothing, however, was very serious, and we have hopes that, generally speaking, our standard classification will be used by the principal bus operators."

He expressed the belief that a national standard was highly important. Touching upon the subject of co-operation, Mr. Lippitt said: "Our association cannot



T. B. MacRae and Mrs. MacRae

fully measure up to its responsibilities without the co-operation of all of its company members and a real personal interest must be taken by them in the association's affairs." A communication from Past-President J. J. Duck was read expressing his regret at not being able to be present.

The report of the committee representing the Accountants' Association at the annual convention of the National Association of Railroad and Utilities Commissioners, W. L. Davis chairman, was read by O. H. Bernd, and received. It gave an account of this meeting.

Prior to the reading of the report of the committee on bus accounting by M. W. Glover, the president expressed his belief that this committee was one of the most important and that bus accounting seemed to be one of the foremost subjects before the association at present. The report is presented in abstract on another page. An

informal discussion followed on the best method for bringing the classification before the various state commissions, after which the report was adopted.

Mr. Glover also read the report of the committee on standard classification of account. This report, which is abstracted on another page, was approved. Tribute to the splendid work of Mr. Glover in the association was paid him by Mr. Heberle, in which President Lippitt joined. Announcement was made that a get-together luncheon would be held at the Cleveland Athletic Club on Wednesday at 1 o'clock.

The address of the afternoon was delivered by Harry Boggs of Herdrich & Boggs, certified public accountants, Indianapolis, who took for his topic "Evolution of Regulation and Accounting." This made a marked impression on the association, so much so that he was the recipient of a rising vote of thanks from the members in addition to the thanks of the chair.

Announcement was made by Mr. Lippitt of the presence in the meeting of President Willits H. Sawyer of the American Electric Railway Association. Stirring, impressional and short, sum up the characteristics of President Sawyer's talk. He told the members that he wanted them to know that he was really interested in their association. Anent the subject of why more accountants did not attend the meetings of the association, he told them that in the final analysis they were the men to whom executives must come for facts. He called their

attention to the time when a man was only a bookkeeper and pointed out the respect in which the accountant of today was held.

The following committees were appointed by the chair: On nominations, T. Kilfoyle, Cleveland; F. E. Wilkins, Youngstown, and W. A. Blasing, Glens Falls, N. Y.; on resolutions, C. E. Yost, Wilmington, Del.; J. P. Hudson, Montreal, and Walter Shroyer, Anderson, Ind.

Buses and Fares Discussed

Reports of committees received and commented on at Tuesday session. W. L. Barnhart speaks on methods for combating embezzlement

THAT bus accounting is a subject to the forefront in the minds of a number of the members of the American Electric Railway Accountants' Association was again evident at the second session of this association. Although discussed informally, it is perhaps safe to say that more interest has centered around it than any other subject during the convention. Many interesting points were brought out and reflected the clear thinking and study of men who are devoting their best efforts to an analysis of the numerous phases the question presents. That it is a subject of national import was evident. Particular attention was paid to the angle of depreciation in bus accounting.

The report of the committee to review the proceedings of the Accountants' Association was first on the program. J. E. Heberle, chairman, advised that the committee had no report to make. Attention of members was directed to the value of the bound volumes of the printed proceedings of the association and particularly the use of the index, to which ready reference could be had to find out whether a study had been made of a special subject.

E. A. Tuson stated that the committee on fare collection had no formal report to make and indicated that it

was the feeling of the committee that the subject did not require an annual report but needed to be kept up to date. He suggested that the members look at the exhibits of the machines pertinent to their line of work.

An interesting discussion followed on the use and advantage of certain types of machines, in which T. H. MacRae, President Lippitt, M. W. Glover and others took part. Another interesting and informative discussion ensued on the subject of a clearing house for tokens.

The speaker of the afternoon, W. L. Barnhart, took for his subject "Combating the Present-Day Criminal," reference to which will be found elsewhere in this issue, which he illustrated with exhibits. At its conclusion President Lippitt thanked him on behalf of the association.

An informal discussion followed on bus accounting, after which the meeting was adjourned.

Graphs an Aid to Accounting

Economies effected by their use illustrated with charts at Thursday session. Resolutions adopted and officers elected

FOLLOWING the opening of the final meeting on Thursday afternoon by President Lippitt, a brief oral report was made for the committee on graphs by C. R. Mahan, chairman, comptroller Chicago, North Shore & Milwaukee Railroad, Highwood, Ill., explaining that most of the work had been done by correspondence. J. F. Egolf, general manager Chicago, North Shore & Milwaukee Railroad, who was present at the meeting and was on the program for "Economies Effected by Use of Graphs" had appointed A. Christesen, general manager's engineer, to act in his stead. Four graphs were then shown and an analysis of them made by Mr. Christesen.

Among them was one comparing passenger car-miles by months with last year and comparison of passenger revenue obtained by months with last year and another



Welcoming Miss Anna Case to the car exhibit

on merchandise dispatch station labor summarized chart showing the cost of handling per ton by months, also M.D. car-miles tonnage and train labor. Mr. Christesen also enumerated other charts which they made.

The report of the committee on stores accounting, abstracted elsewhere in the JOURNAL, was presented by R. A. Weston, chairman, special accountant of the Connecticut Company, which was followed by the address of the afternoon, "Passenger Revenue Handling," by Horace L. Howell, consulting engineer Meyer & Wenthe, Chicago, Ill., an abstract of which appears elsewhere in this issue. Mr. Howell did not read his report verbatim, deeming it unnecessary as copies of the pamphlet had been distributed prior to the meeting, but instead he took excerpts from it, which he amplified. He also analyzed some of the average fare charts which appear in the back of the pamphlet.

This was followed by the report of the committee on nominations by T. P. Kilfoyle, chairman which recommended: For president, T. B. MacRae, general auditor Chicago Rapid Transit Company, Chicago, Ill.; first vice-president, O. H. Bernd, secretary Des Moines City Railway, Des Moines, Ia.; second vice-president, Edwin H. Red, auditor the Brooklyn City Railroad, Brooklyn, N. Y.; third vice-president, C. E. Yost, assistant secretary-treasurer Wilmington & Philadelphia Traction Company, Wilmington, Del.; secretary-treasurer, J. W. Welsh, executive secretary American Electric Railway Association, New York. Members at large: J. E. Heberle, assistant to president the Capital Traction Company, Washington, D. C.; Edward A. Tuson, general auditor Public Service Railway, Newark, N. J.; C. R. Mahan, comptroller Chicago, North Shore & Milwaukee Railroad, Highwood, Ill.; L. T. Hixson, auditor Terre Haute, Indianapolis & Eastern Traction Company, Indianapolis, Ind.

Officers were duly elected and Lucius S. Storrs, managing director of the American Electric Railway Association, stopped in for a few minutes and expressed his pleasure at being with them.

The installation of officers followed and Mr. MacRae, the incoming president, after taking the chair, advised the members that he had always been a great believer in constructive criticism and that he would be more than glad to receive suggestions or criticisms on matters that might be done.

Get-Together Luncheon Held by Accountants

INTERSPERSING pleasure with business, the members of the Accountants' Association held a get-together luncheon at the Cleveland Athletic Club Wednesday afternoon, with 34 members present. An informal discussion took place of subjects that were of much interest and thought to the members, reflected by the responsiveness with which they participated. "Fare collections," "lost and found department" and classifications were the principal themes.

The meeting of the new executive committee was called to order by President L. E. Lippitt immediately after the luncheon. On motion of C. E. Yost, the meeting was turned over to T. B. MacRae, first vice-president. Committee chairmen were then appointed as given in the following:

Bus accounting, E. A. Tuson; standard classification of accounts, M. W. Glover; stores accounting, R. A. Weston; freight accounting, W. Shroyer; review of the proceedings of the Accountants' Association, J. E. Heberle; program, E. H. Reed; fare collections, E. A. Tuson; joint committee on engineering-accounting, L. T. Hixson; committee representing the Accountants' Association at the annual convention of the National Association of Railroad and Utilities Commissioners, W. L. Davis.

Preceding adjournment of the accountants a suggestion was made that a joint session of the purchasing agents and storekeepers and accountants be held next year.



Attractive designs featured the car exhibit on the outdoor tracks



R. H. Dalglish

R. H. Dalglish

New President of Engineering Association

THE Engineering Association at its meeting on Oct. 10, elected R. H. Dalglish, a popular electric railway engineer, its president.

Mr. Dalglish is chief engineer of the Capital Traction Company, Washington, D. C., which company he joined in 1892. Step by step he advanced until in 1919 he became chief engineer. A special honor was conferred upon him in 1922 when he was elected president of the Washington Society of Engineers, comprising in its membership most of the prominent engineers in all branches who make the headquarters at the capital.

His service with the Engineering Association has been noteworthy for his active committee work. In 1921 he served as chairman of the committee on equipment. He had previously been a member of this committee. The following year he was chairman of the committee on specification for a tank, a line of work requiring expert engineering knowledge. His enthusiasm for company section work in the association led to his election, in 1916, as president of the Capital Traction Company section. He has also served as chairman of the Washington section, A.I.E.E.

He is a graduate of the Cochran Scientific School, now part of the George Washington University.

T. B. MacRae

Heads Accountants' Association

THE auditor of the Chicago Rapid Transit Company, T. B. MacRae, will serve as president of the Accountants' Association during the coming year. Mr. MacRae has been in the electric railway field since 1882.

His first position was with the Chicago & Northwestern Railroad in its local freight office in Cedar Rapids, Ia. Here he remained with the company about three years, when he entered the freight auditor's office of the Burlington, Cedar Rapids & Northern Railroad. After two years in this department he was appointed traveling auditor and subsequently chief accountant in the general auditor's office. In June, 1902, this company was taken over by the Chicago, Rock Island & Pacific Railway and he was transferred to Chicago to close the books and accounts of the absorbed company. He remained with the Rock Island Lines until March, 1905, when he was elected auditor of the Metropolitan West Side Elevated Railroad, at that time an independent corporation.

In September, 1911, the four elevated railroads operating in Chicago were brought under a unified management and Mr. MacRae was elected auditor of the individual companies. These four companies were consolidated on Jan. 1, 1924, under the corporate name of Chicago Rapid Transit Company and he was elected auditor of the consolidated company.

With this background of experience in electric railway accounting in its every phase, and with many years of fruitful activity with the American Electric Railway Accountants' Association, Mr. MacRae brings to his new task a combination of talents that is unusual.

Mr. MacRae was born in Jackson, La. He was educated in private schools and at the United States Military Academy.



T. B. MacRae

Edward Dana

New President Transportation & Traffic Association

EDWARD DANA, the new president of the Transportation & Traffic Association, has for many years rendered valuable assistance to that association, and has, at various times, been a member of the committee on standards, rules and schedule in addition to the executive committee.

Mr. Dana's first position in the electric railway field was in July, 1907, with the Boston Elevated Railway, where he spent four years in an apprenticeship course, starting as a conductor. He then became an inspector of service conditions, assistant to superintendent of transportation, superintendent of traffic, transportation manager, and in August, 1919, was called to fill his present position of general manager. He was born July 28, 1886, at Bernardston, Mass., and was graduated from Harvard University with an A.B. degree in 1908.

Mr. Dana's interest in education, particularly of electric railway employees, is known throughout the world. He believes every employee should have all of the education that he or she can absorb. On the Boston Elevated property all educational courses are voluntary, unless the course is put in as a means of instruction in specific duties. Every opportunity is given to employees to know what the educational program is, but beyond that it is up to the employee.

Mr. Dana is ever on the alert for new ideas, and when one comes along he asks first, does this new idea have any application on the Boston Elevated Railway? Then, what is its significance to the industry as a whole?

Mr. Dana likes to see all of the railway data tabulated and if possible put into graphical form. One of his hobbies is the little leaflet "Co-operation" which goes to all employees monthly and to a constantly enlarging mailing list.

While a strict disciplinarian, Mr. Dana never forgets his duties toward the employees as human beings.



Edward Dana

Joseph S. Kubu

President Claims Association

THE new president of the American Electric Railway Claims Association for the coming year is Joseph S. Kubu. Mr. Kubu is superintendent of the accident department of the Cleveland Railway and his election is a graceful gesture to the city which has played host to the American Electric Railway Association for two years.

Back in 1909 Mr. Kubu joined the forces of the Cleveland Railway as an investigator-adjuster and assistant claim agent. Perhaps feeling that, like a prophet, an electric railway claims man is "without honor in his own country," Mr. Kubu left Cleveland for the Empire State in 1912 and became claim agent for the Utica Lines of the New York State Railways. His work with this property was of an order which attracted the attention of many railway executives of the East and Mr. Kubu's services were sought by several of them. He refused all offers, however, until in 1921 the Cleveland Railway called him. Then he left Utica for home fields.

Mr. Kubu's long experience in claims work, his wide acquaintance with men in this department of public utility service and his active participation in the work of the Claims Association eminently fit him to direct the important work of this group during the coming year.



J. S. Kubu

Claims Men Discuss Traffic Regulation

**Uniform traffic laws strongly recommended
as a means for reducing accidents. Co-operation
in enactment of Hoover code urged**

THE opening meeting of the Claims Association was called to order on Monday by President Proctor and at his request the names and companies of all the delegates in attendance were given. A good-sized room had been provided and it was comfortably filled throughout the meetings, which were characterized by close interest.

Mr. Proctor observed, in his annual address, that the work and responsibility of claims men increase greatly year by year. He said that new and more difficult problems are continually presenting themselves. Therefore the question arises, "How can a claims agent best fit himself for his job; keep his mind fresh and alert; keep up with the times?" This cannot be done by living within oneself. The claim agent must study, read and confer with his fellows, who are tackling the same problem as the claims men.

It has been the endeavor of the Claims Association to increase the interest in the work of that body by injecting new features into the meeting. The progressive, wide-awake claims agent in the past few years has largely improved his standing with the public at large as well as with his own management.

The address of Russell A. Sears on proposed uniform traffic regulation and the Hoover conference recommendations is abstracted elsewhere in this issue. It was followed by formal discussion by John J. K. Caskie, Hubert A. Smith for Frank J. Gatrell and F. R. Cogswell for Burton W. Marsh. Mr. Caskie made the point that progress in traffic control should be aided by the claims department only in co-operation with the transportation department. He said that as the older cities of today became the newer cities of the future the opportunity is presented to direct this development so that traffic movements would be facilitated. He recommended creation of a committee including representatives from principal cities, to accumulate data on traffic legislation for the purpose of bringing about uniform regulation in conformity with the Hoover code.

Herbert A. Smith said that the public must be awakened in order to obtain proper legislation and enactment of the Hoover code regulating motor vehicle operations. He felt that the parent association should put forth its best efforts to aid in making the code effective throughout the country and advocated the adoption of a resolution so providing.

Mr. Barnes gave a most interesting talk covering his experiences in the work of the Hoover conference on street and highway safety.

In the general discussion that followed and on the motion of Wallace Muir provision was made for the presentation of resolutions addressed to the parent asso-

ciation and emphasizing the interest of the association in the traffic control provisions of the Hoover code.

At this point President Sawyer addressed the meeting and stated that he thought there was no single group of men in the industry that has more completely adapted itself to changing conditions than have the claims men. He spoke of their fair treatment of the public and of their care in preventing payment of fraudulent claims.

Mr. Hardin's paper was received with much interest and appears in abstract on another page. In the discussion that followed there was general agreement touching the necessity for all members reporting to their index bureaus so that fraudulent claimants and "repeaters" could be detected.

Tuesday's session of the Claims Association was held jointly with the Transportation and Traffic Association to consider questions of traffic and safety. A report of this meeting will be found in the account in this issue of the meetings of the Transportation and Traffic Association.

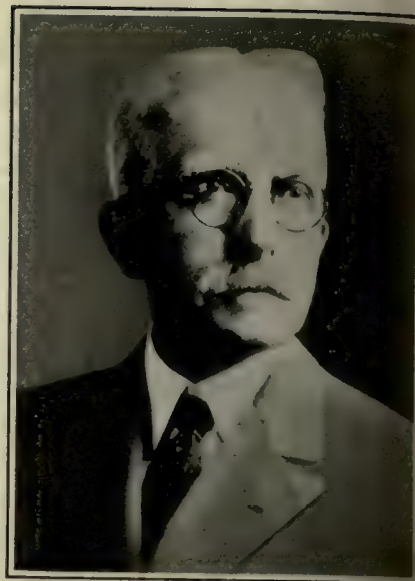
At 1 p.m. on Wednesday the great majority of all the claims men gathered at a strictly informal luncheon at the Hollenden Hotel.

Claims Symposium Arouses Interest

**Various views on live claims topics presented
by active claims men at the Thursday
afternoon session**

THURSDAY'S session of the Claims Association was given up partly to a symposium on claim subjects, partly to the papers secured by the medical and surgical committee and partly to the election of officers and other closing exercises.

The "symposium" comprised discussions on a great variety of topics, all having a very practical bearing on claims work. Some of the speakers had prepared extensive papers; others contented themselves with shorter presentations. Among the former, one by P. W. Klambunde on a recent campaign conducted by representative lawyers in Milwaukee against unfair legal tactics of some attorneys there, and one by J. C. Desautels of



C. B. PROCTOR

Montreal on a card index system he had developed are published in abstract elsewhere in this issue.

On the other topics considered, Walter E. Robinson, Cincinnati, took the position that publicity is not a proper activity of the Claims Department. The matters requiring the attention of this department are more or less of confidential character. He thought that ambulance chasers had thrived on publicity in regard to accidents and claims. While heartily in favor of safety in its broadest sense, he believed that slogans could not be substituted for discipline, nor the responsibility for the safe operation of a railway property left to any one except the responsible operating official. Safety work is an obligation on all departments and should be performed without publicity campaigns, the payment of premiums for discharging a plain duty, or the effort to stampede the public and employees by cheap and ineffectual methods of advertising.

the person whom the company has injured. He thereby creates a fertile field from which the "friendly enemy" reaps a bountiful harvest. The home becomes the opportunity when the claims man takes proper relief there, for he has then proved the company worthy the confidence of its community.

The symposium on claims subjects was followed by that portion of the program devoted to the medical and surgical committee. There were nine doctors present who participated in the discussion.

Dr. H. M. Bascom, chief surgeon Illinois Traction System, submitted a paper, "Should All Accidents Have Medical Investigation, and If So, What Information Is Helpful to the Adjuster"? He took the position that all cases of injury should be looked at from a surgical as well as from a medical standpoint. He felt that there should be at all times a state of complete co-operation



Augustus Baker



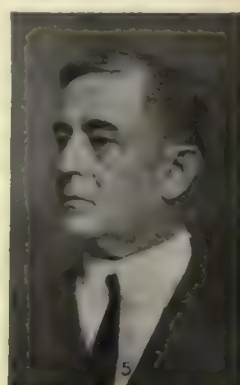
J. C. Desautels



P. W. Klabunde



J. W. Giltner



W. E. Robinson

ing. Finally, he protested against the demands for affiliation with outside organizations. He considered the topics discussed by them often to be not closely related to claims work.

Augustus Baker, adjustment department, Pittsburgh Railways, spoke on "Corrective Management and Its Effect on the Accident Records," and referred particularly to the Better Traffic Committee organized in Pittsburgh to deal with street traffic congestion. It had conducted an essay contest for children on accident prevention, had dealt with automobile parkings and had assisted in the enactment of traffic laws. He also mentioned the monthly management conferences on the Pittsburgh Railways' property to bring about better operation and maintenance. Each employee is made to feel he is an integral part of the organization, and this policy has been followed by a notable decrease in "all-ins" and accidents. Safety measures include a central safety committee, trainmen's safety meetings and competition between carhouses for low accident records.

"Friendly enemies" was the title of the talk by J. W. Giltner, Akron, Ohio, referring to the attorneys for the plaintiff in damage suits. With the reputable lawyer in such a case, the speaker said, the claims men could have no quarrel. He believes that all men are animated largely by the same motives, and with these attorneys, the claim agent gets back largely what he gives. The only fault that can be found is with the so-called ambulance-chasing attorney. The speaker then pointed out that the plaintiff's home was the company's greatest hazard and greatest opportunity. The home becomes the hazard when the claim agent fails to take proper care of

between the physician representing the company and the patient's family doctor.

Abstracts of papers presented at the medical and surgical sessions by Doctors Fisher, Miller, Sibley and Leeming appear, in abstract, elsewhere in this issue.

In the discussion following the medical reports Mr. Boynton of Portland, Ore., said it would be of great help to all claims men if the doctors would make their reports in plain English. He said that he had many times found it necessary to refer to the dictionary in order to see what was wrong with the patient only to find that the case was merely one of bruises or slight skin abrasions.

President Proctor announced the appointment of a committee on resolutions on uniform traffic regulations as follows: John J. Kaskie, Wallace Muir, John J. Reynolds, W. F. Weh and S. W. Baldwin.

The report of the nominating committee was made by Mr. Reynolds, its chairman, as follows:

For president, Joseph S. Kubu, Cleveland Railway; for first vice-president, L. F. Wynne, Georgia Power Company, Atlanta, Ga.; for second vice-president, Walter E. Robinson, the Cincinnati Street Railway; for third vice-president, C. E. Redfern, United Electric Railways, Providence, R. I. Executive committee: W. E. Foley, Third Avenue Railway, New York; B. F. Boynton, Portland Electric Power Company; S. J. Herrell, Knoxville Power & Light Company, and L. H. Butterworth, Boston Elevated Railway; convention secretary, G. T. Hellmuth.

Mr. Reynolds presented to President Proctor a past-president's badge and accompanied it with a splendid address outlining Mr. Proctor's unselfish services to the association.

Milwaukee's Ambulance Chasing Quiz*

By P. W. KLABUNDE

General Claims Agent

Milwaukee Electric Railway & Light Company

OVER a period of years the activities of ambulance chasers in Milwaukee and its neighboring cities grew to the point where approximately 90 per cent of personal injury litigation was in the hands of but five or six law firms. There was evidence that runners worked openly and had developed a tip-off system through newspaper reporters and others. They frequently learned of accidents and reached the homes of injured persons before their families heard about them. Contracts were frequently procured in hospitals before the injured had recovered from the first shock. Chasers were ready to remove the injured from the hospitals, sometimes before the doctors could make their examinations. The evil was discussed by the Bar Association at times, but no definite action was taken.

Several years ago an independent organization of attorneys was formed, under the name of "Lawyers' Club," one of the objectives of which was to rid the bar of this evil. This club worked quietly until March, 1927, when a committee of its directors and officers petitioned the Circuit Court to conduct a hearing or inquisition and to take such action as the facts might warrant.

The petition was presented to a judge of the Circuit Court, there being eight branches of this court, and he decided that the petitions should be heard. Two other judges of the same court joined in the hearing, the three judges sitting *en banc*.

The matter was handled entirely by the Lawyers' Club. There was no assistance from public utilities or insurance companies, either financial or by way of providing information from which to develop the facts. The Lawyers' Club caused a study to be made of cases pending in the Circuit Courts and in the Civil Courts (the jurisdiction of the latter is limited to \$2,000); plaintiffs in pending cases were evidently interviewed beforehand and then subpoenaed. Lawyers and ambulance chasers, their clients and representatives of public utilities and insurance companies were also called into court.

The testimony developed instances of champertous contracts, suits filed without the knowledge or consent of claimants and suits filed between members of the same family, where, so far as the parties to the actions were concerned, the same law firm represented both sides. It also developed instances where claimants were fleeced by their attorneys not only of exorbitant fees on a percentage basis but of practically the entire proceeds of the settlement. It also was revealed that solicitation was practiced in other than personal injury matters.

In the early stages of the inquisition efforts were made on behalf of the ambulance chasers to stop the proceedings, but the Supreme Court of the state denied an application for a writ of prohibition. One individual attempted to stop the proceedings, temporarily at least, by starting an action against the committee members. He served notices for examination on them under our

discovery statute, the notices being accompanied by an affidavit alleging that the entire proceeding was in the nature of a conspiracy for the purpose of destroying his good name and reputation and that it was an attempt to perpetrate a fraud upon the court.

This attorney came into court and was requested by the judges to testify under oath as to the facts relative to his charges of fraud. He refused to be sworn and was sentenced to serve a term of 30 days in the county jail for contempt. The judge of another branch of the Circuit Court issued a stay, but the Supreme Court vacated this order; however, the Supreme Court then called for the entire record of the inquisition and the matter is still under consideration.

The inquisition has not been completed, but thus far it has accomplished these results: the complete cessation, so far as we can discover, of ambulance chasing by runners from lawyers' offices; an injunction restraining all ambulance chasers and attorneys in "tainted" suits from making any disposition of cases then in their hands where evidence of improper contracts was disclosed, attorneys have been required to relinquish their claims and the claimants authorized to engage other counsel or to handle their claims in any other manner they choose even where the claimants expressed a desire to retain the same attorney, the court has refused in most instances to permit them to do so.

Another result is that people who have had claims handled by attorneys are now making inquiry as to how their claims were disposed of. It has been rather interesting to learn how the proceeds of settlements were divided. For example, one claimant, who signed a release for \$50, was given \$175 as his share, whereas two other claimants, having claims arising from the same accident and who each signed releases for \$200, received \$20 each.

A still further result of the inquisition is found in personal injury cases going to lawyers who never before handled such cases. They could not get them because the runners worked too fast.

Our legislature was in session during the inquisition and the Lawyers' Club and the judges were instrumental in introducing several bills for its consideration. Briefly these bills provide:

First, that all investigators and adjusters should be licensed.

Second, that no settlement of a personal injury claim should be valid if made within ten days of the happening of the accident and that any settlement should be subject to review upon petition of the injured person to the Circuit Court within 90 days.

Third, that upon demand of either party upon the other the names and addresses of all witnesses must be produced; this bill did not limit the names of witnesses to those that would probably be produced on trial, but included all that the adverse party knew of or discovered prior to trial.

Fourth, that there should be no solicitation in any manner, there should be no payment, direct or indirect, to any person for bringing a case to an attorney, and that no attorney should "split" fees with others than attorneys.

The legislature acted upon these bills and the first three were defeated; the fourth, however, was passed and is now in effect.

The members of the Lawyers' Club who were active in the conduct of the inquisition devoted many days to this work, without hope of reward other than the cleansing of the bar. Not one of these active participants, so far as our records show, has been retained in a case against us since the inquisition started.

As stated earlier, there was no active participation by public utilities or insurance companies in the entire matter. Of course, representatives of the various companies

*Abstract of a paper presented at the annual convention of the American Electric Railway Claims Association, Cleveland, Ohio, Oct. 3 to 7, 1927.

who were subpoenaed supplied the information asked for an examination, but it was the general feeling that the companies could not take an active part without creating the impression in the public mind that the corporations were trying out a new way to reduce accident costs.

When the entire inquisition is completed, it is believed that the solicitation of personal injury cases will have been very effectually curbed, and it is not unlikely that several members of the bar will devote their time to their employment.

Cost Reducing and Simplifying Claims Office Work*

By J. C. DESAUTELS
Acting Claims Agent Montreal Tramways

MADE a survey recently of the many details attached to the office end of the work. We had seven books of different kinds, large and small, some easy to handle, others quite cumbersome, but all needing several unnecessary movements—entries which I thought could be eliminated.

My first attempt to reach a solution was the cards shown herewith. One was devised to show accidents only, the other to show incidents. I thought of combining the main points of the history of a claim or incident on one card as well as a foolproof follow-up to show at a glance the movements of the file and its exact location. The principle that I had in mind and wanted in practice was "one place, one movement to get the file," and

*Abstract of a paper presented at the annual convention of the American Electric Railway Claims Association, Cleveland, Ohio, Oct. 3 to 7, 1927.

as it is human to follow the line of least resistance, the card was arranged in the exact sequence that the work progresses from inception to finish.

To avoid mistakes, it was decided that all files, documents, etc., must go first and always to the clerk having the sole and full charge of distribution.

ARRANGEMENT OF CARD

The name and address are at the top and bottom, so that when card is taken off the filing system, becoming what is called "dead records," the card can be filed vertically. The top part is then the guide to the card. The abbreviations used are as follows:

Emp. Record. A tick here shows that proper information has been entered in the employee's claim record.

Inv. No. Means by whom investigated.

List. A tick here shows that the crew of the car or train have been seen by investigator.

Steno. (Stenographers), Abeyance, Ready. A tick in the space reserved for any of these would show in whose hands the file is.

Same as. To show that other claims have been made for the same accident.

Train. To classify or differentiate from the next abbreviation—namely, O.M.C. (One-Man Car).

Bus. For all bus accidents.

T. For accidents at terminals.

O. C. This space is reserved for a conventional sign or mark to help in summing up or valuation of O.C. (Outstanding Claims).

The rest of the card needs no explanation. Arranged in this way, the moment a claim is filed the first entry is at the top of the card and so on until the case has passed through the courts, judgment rendered and cost entered, if any.

I do not claim to have discovered the 100 per cent per-

NAME (In Full)										ADDRESS										CLAIM NO.																			
DATE OF ACCIDENT										NATURE OF ACCIDENT										ACCIDENT NO.																			
PLACE OF ACCIDENT										DATE CLAIM ENTERED										EMP. RECORD										DATE CLAIM STARTED									
INV. NO.		INVESTIGATION FINISHED		LIST		STENO.		ABEV.		READY		SAME AS		TRAIN		O.M.C.		BUS.		T.		O.C.																	
DECISIONS OF CLAIM'S COMMITTEE																																							
AMOUNT OF CLAIM				DECISION				DATE				DECISION				DATE				SETTLEMENTS EXCEPT THOSE OUT OF COURT OR BY JUDGEMENTS																			
																				AMOUNT				DATE															
WRITS—SUITS—ACTIONS—OR NOTICES OF ACTIONS																																							
DATE OF NOTICE				DATE OF WRIT				COMPENSATION ACT				PLAINTIFF'S LAWYERS																											
AMOUNT				AMOUNT				IN FORM A PAUPER IS				DEFENDANT'S LAWYERS																											
SETTLEMENTS OUT OF COURT AND JUDGMENTS																																							
OCCUPATION										AGE										ADDRESS										CLAIM NO.									
NAME IN FULL																																							

Report No. 193, on a card 5x8 in., has proved most useful in indexing claims records

fect card or handling classification and follow-up of a claim, but I do pretend that this system resulted in the following:

1. Cost of printing, binding, etc., of seven books eliminated.
2. An electroplate has been made which will save cost of printing when other cards are needed.
3. Going from one book to another and constant handling of them eliminated.
4. One movement and to only one place, always.
5. Nothing left to memory and checking reduced to the minimum. It is necessary simply to follow the lines and fill in as the work progresses.
6. Duplicating and sometimes triplicating of entries eliminated.
7. Records conserved clean, orderly, visible and readily accessible.

The only book used is the 60-subdivision-numerical index.

By actual stop-watch test, from 60 to as much as 200 per cent of time is saved.

All investigations outside of claims are handled in the same way but on the second card shown, so as to eliminate further unnecessary hunting up of the file.

With this system, inaugurated Jan. 1, 1927, not one of the papers and numerous files has been mislaid so far. I also believe that an appreciable amount of red tape is avoided and the equivalent time saved thus applied to constructive instead of detail work.

Possible questions will be raised in advance and answered:

Why is another numerical index necessary?

If claims were handled alphabetically, direct from the visible index, we should have to run through names on claims which have been disposed of years ago, whereas, by the present system, we have live records only to

handle. Moreover, cost is reduced to minimum by using three visible index cabinets only. When they are filled the first one will contain only records which are dead or nearly so. We then transfer the cards into a vertical position in ordinary drawers. This explains why the name and address, etc., appear at the top as well as at the bottom of the card. In the visible index, only the lower section of the card shows, but as this part is at the bottom when filed vertically, the top part is needed for a future guide.

The use of numerals has several advantages over the alphabet, for when compiling statistics of all kinds, you have at a glance the number of claims made during any particular year, and taking out the cards for that year they follow numerically, and therefore daily, monthly, etc. If, for instance, you want to figure out the number of train, one-man-car or bus accidents for a particular year, it becomes a simple addition. If they had been filed alphabetically, it would be necessary to keep other records showing those for the year 1926, etc., and sort them out. The same applies to every item shown in proper sequence on the card. Whatever statistics are required, and usually they are needed on short notice, the operation is simplicity itself, and the work of compiling can be entrusted to the least experienced clerk you have. The way I use the system I have an instant check on the progress of current claims or the past history of them, and, as the card shows, I can tell when a claim was filed, the investigator who has it, and how long.

How many cards are used per day?

Divide the number of claims received in a year by the number of days the office is open for business and you have the answer.

How is a no-report case located?

We call them blind cases. If for a claim, we give claim number, etc., following the same order as shown

						TO NUMBER	
FOLDER NO.	DATE OF ACCI.	CAR NO.	PLACE OF ACCIDENT			NAME	
ACCIDENT NO.	INCIDENT NO.	ADDRESS			INV. STARTED	BY NO.	INV. FINISHED
REMARKS						LIST	STENO.
FOLDER NO.	DATE OF ACCI.	CAR NO.	PLACE OF ACCIDENT			NAME	
ACCIDENT NO.	INCIDENT NO.	ADDRESS			INV. STARTED	BY NO.	INV. FINISHED
REMARKS						LIST	STENO.
FOLDER NO.	DATE OF ACCI.	CAR NO.	PLACE OF ACCIDENT			NAME	
ACCIDENT NO.	INCIDENT NO.	ADDRESS			INV. STARTED	BY NO.	INV. FINISHED
REMARKS						LIST	STENO.
FOLDER NO.	DATE OF ACCI.	CAR NO.	PLACE OF ACCIDENT			NAME	
ACCIDENT NO.	INCIDENT NO.	ADDRESS			INV. STARTED	BY NO.	INV. FINISHED
REMARKS						LIST	STENO.
FOLDER NO.	DATE OF ACCI.	CAR NO.	PLACE OF ACCIDENT			NAME	
ACCIDENT NO.	INCIDENT NO.	ADDRESS			INV. STARTED	BY NO.	INV. FINISHED
REMARKS						LIST	STENO.
						TO NUMBER	

Report No. 194, on card 5x8 in., has also proved useful in indexing claims records

of the card. Wherever possible, I interview the claimant personally at my office and retracing his movements minutely, I take a written version accordingly. If the party is unable to come, I send an investigator to secure the information. With this information, together with a full description of the car or crew, we locate cars for about 30 minutes before and after the time given. We then begin a systematic sifting or elimination until we narrow down the search to a few, and these men are then interviewed. With this procedure we rarely miss our objective. Once the crew has been located, versions are taken and we build up on the claim with whatever information we have, as in the ordinary claims.

If you have the date and location of an accident, but no name, how could you locate the report?

An accident book is kept containing enough pages to last a year (previously it was for six months). Each accident report is numbered and the salient facts as given in the report are entered in the book. The numbers start from 1 at the beginning of each month. As many pages as needed are reserved for all accidents happening on that particular date. If we have the date, which is the quickest way to locate the report, with any other particular detail such as car number, location, name of conductor or motorman, or kind of accident, etc., all we have to do is open the accident book at the date mentioned and when one of the details just mentioned, the report is found at once by its number. Each report, being of foolscap size, is folded in four and filed upright in suitable steel filing cabinets and the number is seen at the top as in a card system. We also have "incident" books, arranged in the same way as for an accident book.

How is Form 194 (the incident card) used?

Four divisions will be noted on this form. As this form does not need as much information as the other card, I show four different cases on one card. The use of the divisions on the card, in their order, is as follows: "Folder No." This is for employees injured on duty. A folder or docket, large enough to hold a foolscap-size file, is prepared for each employee injured. On the face of the folder appears in condensed form all important details contained in the folder. "Date of acci." "Car No.," etc. do not need explanation, as the same scheme or follow-up is followed as with the claims card. It follows that Form 194 is used for anything not a claim. The argument may be advanced that, having four different cases on one card, the top or bottom one only would show in a filing cabinet. True, but it will be found in practice that incidents are of a temporary nature only, and once dealt with, it is necessary to refer to them again only on extremely rare occasions. Then we take the incident book and from it easily locate the card needed, since they are dated.

Form 193 carries two numbers. Is it first given an accident number and later a claim number?

No. I have just described the way in which the accident report book is kept. When a claim is filed against us, the card receives a claim number and the accident report being then taken out of its numerical place in the steel filing cabinet and an appropriate card being put in its place, the number of the report is entered on Form 193 at the same time as claim number. Other details which can be taken from the accident report are added.

What distinction is made between "date claim started" and "date claim entered"?

The claim entered means when or on what date the claim was filed by claimant. The other date is that when the investigator began his work on that claim.

Fifty Foremen Attend Conference

Course given twice a day during convention week.
Representatives from companies in many parts of the country attend

AWAY from the rush and bustle of the main sessions of the convention, a group of men met for study in a room on the mezzanine floor of the Auditorium. They were the members of the Foreman Conference Leaders group, who were fitting themselves in the special course offered by the association committee on education to spread the lessons of better employee leadership to all parts of the country.

Intense interest was displayed by the men, according to H. H. Norris, educational adviser Boston Elevated Railway, one of those in charge of the course. Associated with Professor Norris were A. J. Sarre, superintendent of industrial relations New Orleans Public Service, Inc., and Frank Cushman, who is connected with the Federal Board for Vocational Education, Washington.

Registration for the course was limited to 50, and it was necessary to reject a number of applications so many companies wished to have representatives enrolled for the class. For the most part those taking the course were officials having under their supervision large groups of trainmen and other employees and directly in contact with personnel problems.

The class was divided into two groups, one meeting each morning and the other in the afternoons. The classes were open to the public on Friday, but the rest of the week the classes were secluded as if on a college campus, rather than within a few steps of the manifold activities of the convention.

The purpose of the course was to train the officials attending in the best methods of conducting conferences of their foremen, so as most effectively to transmit to them approved methods for training their men. The idea back of it all is that the trainmen and other workers are, in the last analysis, largely responsible for the success or failure of a company's efforts to give good service and to operate efficiently. To enable the workers to do their part, they must have the leadership of a capable supervisory force, and this supervisory force, or the foremen, must have real leaders among the executives directly over them. The course was designed to train the executives in order that they might conduct conferences of their foremen or supervisors in a way that would accomplish the results desired.

Not only did the officials receive many new ideas from those conducting the course and from each other but one of the most important elements of the training was the actual experience they had in conducting conferences. A part of each day's session was devoted to practice of this sort in which one or another of the officials conducted a conference and then received the benefit of the criticism of the others and of the instructors.

The wide interest in this new educational activity was shown also by the fact that a number of companies supplied literature for use in the course. This included instruction manuals, educational booklets, job analysis studies, etc., supplied by the Westinghouse Electric & Manufacturing Company, Boston Elevated Railway, New Orleans Public Service, Inc., Chicago, North Shore & Milwaukee Railroad, Milwaukee Electric Railway & Light Company and others.

We Must and Will Go Forward*

The lessons of the past and present are being well learned, and the electric railway industry has profited by them. The electric railway man has reason to be proud of his job and can look to the future with confidence

By W. H. Sawyer

President American Electric Railway Association
President East St. Louis & Suburban Railway

SOME of you may not have had the occasion that I have had during this year to think in terms of the industry instead of in terms of a single property or even a group of properties. Out of that experience I have had a thrill, growing in magnitude and reaching a climax here today. I have gone over this exhibit during the past few days. If you haven't, don't miss the inspiration that it will give you. You will get a new viewpoint on your own industry. You will feel thoroughly, as I feel at this minute, the romance of transportation.

What a myriad of changes have taken place during the past 46 years! I shall not attempt to review them. But despite all of these changes and all of the difficulties which we have encountered, we are not a dead or decadent industry! We are demonstrating our ability to meet the changed conditions brought about by the advent of the private automobile. We are proving our assertion that our industry is still a most essential industry—necessary for civic advancement and prosperity. For generations it has been a major contributing factor in our wonderful national growth and advancement. It will continue as such. Public transportation must and will go forward.

We are making progress in the program of modernizing our cars and equipment to meet the demands of this luxury-loving, fast-spending age. It needs but an inspection of this car exhibit to testify most eloquently to the truth of this statement. But we are carrying forward more than merely a program of modernizing our cars. We are carrying forward a program of modernizing our thought and our methods.



W. H. Sawyer

We have every right to be proud of what we have accomplished. But I say you—and mark well the words—we have but taken forward step. Our job far from complete. The never was a time in the history of the industry when there was a greater demand for skill, energy and ability to carry out the task which we have only well started.

Who is there among that has exhausted the possibilities for giving better service? I do not mean "give" in the sense of a donation. I mean it in the sense of improvement designed to bring a return, both in the form of increased patronage and the form of public good which I mean it in the sense of service which a far-sighted progressive merchant gives the customer with whom he does business. I mean it in the sense of service which good business.

I am, of course, fully aware that some of our electric railway lines that are now operating will eventually be scrapped. One of our immediate problems is to determine which lines do not have the potential earning possibilities to justify rehabilitation. Those that can be made profitable must in the very nature of things be abandoned. I fully realize our duty to our communities to continue service, but we also have a duty to our investors, and, moreover, unprofitable service will eventually be a liability instead of an asset to the community. The lines which are to survive must be modernized. It requires rare courage and foresight to determine just which lines are to be eliminated. But the decision must be made, and made quickly; otherwise the entire property will continue to degenerate at a cumulative rate. The cost of rehabilitating those lines which are economically justified is far from complete. There is no room for a discussion of the necessity of clean cars and prompt and courteous trainmen. There is no longer room

*Abstract of presidential address at the annual convention of the American Electric Railway Association, Cleveland, Ohio, Oct. 3 to 7, 1927.

discussion regarding the need for advertising as a medium for giving our communities the facts of our business.

All this, however, is not enough. I believe that we are on the verge of fundamental and basic changes in the character of our service and of the equipment with which it is given. I have referred before to the quantity and quality of our exhibits, but this year as never before we have concrete examples of unmistakable advances in the art. I refer particularly to some six or eight exhibits among the modernized cars on the outdoor track. Some of these developments are largely experimental, in that they represent radical departures from established practice. But I believe that these changes are only forerunners of a definite trend of new developments out of which will come improved facilities that are essential to us in rendering a character of service that will meet the conditions which exist today.

Let me bring to your mind another thought here. Development such as is represented by these particular exhibits costs real money. Somebody believes in us. Somebody has faith in the electric railway industry. Somebody is willing from a hard-headed business viewpoint to spend money to demonstrate that the street car is still the most efficient passenger-carrying vehicle on the streets and can provide a class of service which will meet the tastes of an automobile-educated public. I take my hat off to those manufacturers and operators whose equipment is out there on display today. I feel confident that only a few years from now we shall look back on them as real pioneers who started us on a new period and a new era.

Even now I am willing to prophesy that the year 1927 will stand out as a year in which officially we took notice of another changed condition, and so revised our constitution as to bring it up to date. We shall still retain the name American Electric Railway Association; that is probably justified, because the electric railway still remains and will remain the backbone, the foundation stone, if you please, of the local transportation business. We shall, however, by the changes proposed in the constitution of this association, rightfully identify ourselves, not as electric railway men only, not as bus men, but as transportation men qualified to serve our communities in whatever form of transportation best fits its needs in each special situation.

There has come about in 1927 not only additional progress in the co-ordination of the bus and the electric railway car but further and more definite co-operation between the bus manufacturers and the industry. We have not yet taken full advantage of the bus and have by no means fully co-ordinated it with the electric car.

The day of the bus as a fad is gone. Some of the buses now in operation are unnecessary. The bus cannot and must not compete for the same business in the same territory with the electric car. That is inefficient and is a waste of the rider's money. High-pressure methods of salesmanship and overenthusiastic statements of fact

have been detrimental to the sound development of the bus as a responsible transportation agency. But I see new developments ahead in the application of the bus as a transportation vehicle, whereby it will expand its present usefulness.

The relations which exist at any particular time between our companies and our communities are a measure of the condition of the transportation business. On the relations which exist between them and on their ability to understand each other's viewpoint and problems depend the success of the partnership which is thus effected. Two factors are directly influenced by the nature of the relations which exist between these two principal interested parties—namely, the character of the service which

it is possible to maintain and the cost of giving that service.

During the last few years there has been a marked change in public opinion regarding the relative importance of these two factors. Although the memory of the old 5-cent fare which was exploited so many years by politicians still remains in some cities, much more consideration is being given today to the matter of service and less to the maintenance of a fixed or lower fare.

There is an ever-increasing appreciation of the fact that if desirable service is to be maintained, the company must be permitted to develop a financially healthy condition. Our industry is making an honest and determined effort to give better service at the lowest practicable price consistent with such service. I am confident that no community wishes to deprive itself of the advantage of such improvement to save an additional cent or two, particularly when the cost of the street-car ride is compared with that of its principal competitor, the privately owned machine.

The automobile has provided pleasure and recreation to millions of people. Its manufacture has become one of our largest industries and has contributed materially to the prosperity of the country. The automobile is, in part at least, responsible for the prosperous conditions of today. But I wonder how many of our city officials really appreciate the comparative transportation economies of the automobile and the street car. Many traffic checks in various cities have shown that the average passenger load in automobiles is less than 1.8 passengers per vehicle. The average street car carries ten or more times that number. The street car is a conserver of expensive street space, while the increased use of automobiles is dependent on making available additional street capacity at the expense of the community. In solving their traffic problems many cities are taking cognizance of these facts and are assisting in increasing the speed of the electric cars by giving them the right of way wherever practicable, thus catering to the majority without detriment to the minority.

The changed conditions of today do not admit of our industry carrying the burdens of the past. We can no longer be used as tax gatherers. Many progressive communities have eliminated the unjust and unfair paving

WE ARE carrying forward more than merely a program of modernizing our cars. We are carrying forward a program of modernizing our thought and our methods.

Our record entitles us to ask for and to receive the co-operation of the communities we serve. We are making progress, but we could move faster if our communities better understood our problems.

Nothing has been found to take the place of the electrically-propelled rail-borne car for moving masses of people rapidly and efficiently.

EXCERPTS FROM MR. SAWYER'S ADDRESS

tax, and rightfully so for the benefit of the community. There is an increasing appreciation that it is unfair to ask the car rider, who in the last analysis pays the cost, to have any considerable part of his carfare represent a tax levied by the community. Electric railways have in the past paid an unfair property tax. Capital invested in a utility is turned over very slowly in comparison with many manufacturing or commercial enterprises, which frequently turn their capital several times a year. Nevertheless the tax rate on transportation property is maintained at rates very much out of proportion to this situation.

The continued improvement of public transportation service is dependent on permitting the investor in these properties to make a fair return on a fair value. There are but few electric railway companies doing that today, and that is why we must have even greater co-operation on the part of our public to discharge more effectively our full responsibility as public servants. We are no longer asking for sympathy. We believe that our record entitles us to ask for and to receive the co-operation of the communities that we serve. We are making progress, but we could move faster if our communities better understood our problems.

Frankness compels the statement that there is always a minority who do not want to understand the facts of the transportation problem and whose selfish interests are served best by trying to make the American public think it can get something for nothing by squeezing the life out of the transportation companies. The fable of the goose that laid the golden egg has a direct application in the transportation situation. The fact that the public is beginning to understand the truth today is largely attributable to the frank and effective way in which many companies have told their story through local newspaper and other advertising. I do not believe there is a man or a company in the industry who is doing too much in this direction. There is still room for an even better and more effective job.

And so, to summarize, conditions of today are different from those under which we built and learned to operate electric railways. The methods of the past are no longer effective. The solution of our many problems requires experts—specialists.

With the coming of this new day, our eyes are turned to the front and there is courage and hope in our hearts. Despite all of our difficulties, one incontrovertible fact stands out above everything else: The very life and progress of modern communities require adequate and efficient public transportation. In the foundation-shaking test to which present transportation agencies have been subjected, nothing has been found to take the place of the electrically propelled rail-borne car for moving masses of people rapidly and efficiently.

Transportation is a vital community requirement. The roots of our industry are buried deep in the foundation of community prosperity and growth. We have cause to be proud of our jobs and have every reason for throwing our spirit and our energy into the work of keeping abreast with the march of progress. Conditions are changing—yes, changing, not yearly or monthly, but daily. We are public servants in the true sense of the term. By dedicating ourselves to the community's interests, we aspire to that greatest of achievements—the service of mankind. The electric railway industry must and will go forward!

Getting the Most Out of Public Utility Regulation*

By W. W. Potter

Attorney-General State of Michigan, Lansing, Mich.



W. W. Potter

The author traces the development of utility regulation and shows that it can be of great benefit to the utility. The electric railway, by giving the right kind of service, will have little difficulty with regulatory bodies

WHEN the balance of power and population in the United States passed from rural communities to the cities and villages, public utility problems became important. Public utility securities at that time were not regarded as sound investments, and few of them had the confidence of the general public. They were generally local in character, and in dealing with several cities their promoters were confronted with uncertainty of success, the question of public patronage doubt as to the ultimate growth of the cities themselves, the crudeness of the art and excessive costs of construction.

*Abstract of an address delivered at the annual convention of the American Electric Railway Association, Cleveland, Ohio, 3 to 7, 1927.

on. As a result of the general lack of scientific knowledge in relation to public utility problems, promoters provided for high franchise rates to be paid by the public in order to insure as far as possible the integrity of their original investment.

When prices fell in the United States during the early 1900s, operating methods had been greatly improved and operating costs fell to a much lower level than ever before. Many public utilities insisted upon maintaining their franchise rates and capitalized, through application of water, the difference between the fair return on the fair value of the investment in the utility and the amount of income realized from the franchise rates.

The Granger cases marked the first successful assault by the general public upon what had been regarded as the sacredness of public utility franchise contracts. The rule became firmly established in the jurisprudence of the United States that when property was invested in a business charged with a public interest, it must submit to public regulation. Outside the ranks of the owners and operators of public utilities, thinking men became interested. Reasonable men everywhere recognized that rate-fixing franchises had usually been given to the utilities without consideration.

Some intelligent method was demanded to handle the ever-recurring problems resulting from the conflict of interest between the utilities and the public, and public utility commissions were called into existence as a means by which the solution of these vexatious problems might be solved. Notwithstanding all of the opposition to the creation of public service commissions, they were finally created, and with them in many cases came rate reductions. Simultaneously the conditions of operation radically changed and public utilities rose to a new standard.

With this growth and development of the scope of operation and with state regulation there has grown up a more tolerant spirit toward the regulatory bodies of the state. There always have been and probably always will be divergent views of public utility regulation. On the one hand there are those who believe that the public service commissions should prescribe with great detail the manner in which the business of the public utility corporations should be carried on. On the other hand there are those who believe that the owners of a public utility should have a right to carry on the business with the least possible interference from public authorities.

ATTITUDE OF UTILITIES TO THE PUBLIC

One of the things which public utilities should seek to avoid is being crucified by their own anxiety to obtain rates in excess of a fair return upon the fair value of their used and useful property. *Smythe vs. Ames*, in which the rule was first authoritatively laid down that a public utility was entitled to a fair return upon the fair present value of its property, was argued before the Supreme Court of the United States.

Some courts have held that reproduction cost now constitutes the dominant factor in the determination of the present fair value of property, but this method seems unfair to both the public and the utility investors.

Nothing has weakened the confidence of the investing public in the securities of public utilities in the past more than has watered stock. Non-existent overheads, the cost of hypothetical superintendence of unknown labor, added percentages for imaginary errors and omissions are all methods of adding fictitious value. How

much more satisfactory it would be to all concerned if in rate proceedings, instead of furnishing volumes of testimony about fanciful intangibles, a fair present value could be agreed upon which would be available to the public or to the regulatory body. If the securities of public utility companies have back of them appropriate tangible assets, they will command public confidence.

The public is very apt to oppose any demand for an increase in the rates paid for transportation on street railways, but if the service is bettered, it is willing to pay for it. Subnormal operation never yet was entitled to abnormal rates. The public cares little or nothing for the question of original cost, fair value, reproduction cost new less depreciation, or any other befogging data, but it is interested in good service. If the street railways make an intelligent effort to render better service, it seems that they will receive the aid of the public and the questions of rates and revenues will take care of themselves.

One of the ways the public can help the street car companies is by relieving them of the burden of paving between their tracks, enabling the companies to improve their service.

It is contended by many that the street car is passing. However, a recent investigation revealed that last year the street railways carried more passengers than ever before. It is the most safe and economical means of transportation yet developed.

PUBLIC UTILITY REGULATION HERE TO STAY

"Customer ownership" is one of the things that will make for better public relations. Public utility investments are safe and satisfactory to the customers, and in addition to creating a better public sentiment, substitute co-operation between the customer and the utility. Public utility regulation is here to stay and fighting it is effort poorly spent.

There has been a tendency in the last few years to make public utilities a means whereby a large amount of money might be raised for taxation. The street railway is assessed supposedly at the true cash value of all its real and personal property, the same as other property assessed upon an ad valorem basis. It pays its proper proportion of the highway taxes levied in the several communities in which it is assessed, and it has to stand by and see this money, paid by it through taxation, expended in the construction of hard-surfaced highways paralleling its lines, which tend to build up and strengthen competition to its own business.

The time is not far distant when these utilities which for the past ten or fifteen years have had hard times in many ways will be taken in hand, rehabilitated, their securities rendered more valuable and the revenue made sufficient to pay operating costs and a fair return upon the fair value of their property. Such adjustments may easily be made, and not only will insure the continuity of the service but will also make the service sufficiently attractive to the public actually to increase its riding habit.

If the street car companies admit they are dead, there is no reason why they ought not to be buried. The street railway, like everything else, must keep abreast of the times or fall into the discard. If the service furnished is courteous, rapid and safe, it will be patronized and profitable, and regulatory bodies will not have to spend time wresting with its problems.

Reducing Delays to Street Car Traffic*

By Miller McClintock

Director Albert Russel Erskine Bureau for Street Traffic Research,
Harvard University

CONFLICTS between rail and rubber-tired vehicles in the traffic stream are more apparent than real. The aim of sound traffic control should be the adjustment of these difficulties so that a minimum of conflict will result.

Any approach to the problem of traffic regulation which is predicated on an elimination of either rail or rubber-tired vehicles or which is based on a policy of arbitrary restriction or oppression of either group is predestined to failure. Motorists can gain no advantage on streets where street cars are blocked. Traction operators can find nothing but embarrassment on arteries of travel where restrictive legislation and arbitrary enforcement have resulted in automobile congestion. Both motorists and car riders have the common desire to move and to move with safety and convenience. On our saturated city streets this common aim can be attained only when each is willing to submit to reasonable control.

In the consideration of any street traffic problem, guesswork and opinion can be of little assistance. When all American cities recognize the street traffic problem as one requiring sound and continuing engineering consideration, much more rapid progress will be made.

A study of street-railway operation in Los Angeles in relation to general traffic conditions was conducted last month. The checks were made covering all of the principal lines operating in the central congested district, approximately one mile square with a daily entering traffic of 9,000 street cars and 200,000 motor vehicles. Results are summarized in an accompanying table. The average speed while in motion was 10.2 m.p.h. but, due to delays, the average over-all speed was reduced to 6.3 m.p.h.

Delays due to vehicular traffic on tracks cause a maximum feeling of irritation to the traction operator. The Los Angeles study indicated that this factor accounts for



Dr. Miller McClintock

5.4 per cent of the total delay. This figure is far below that anticipated, and it is believed that similar studies in other cities will indicate more favorable conditions than those estimated through casual observation.

There is obviously no perfect remedy on densely crowded streets for this type of obstruction. Had the present saturation been anticipated, streets would have been so designed as to permit a curbed-in right-of-way for traction lines and thus for an elimination of interference. This is a practice now being followed in many new developments throughout the country and deserves the fullest consideration. It is, of course, a remedy which cannot be contemplated in the crowded streets of central districts.

The attempt that has been made in a number of cities definitely to prohibit the operation of motor cars on

street-car tracks along crowded thoroughfares is one which, to my knowledge, has never been successful and has resulted only in irritation and opposition. The motorist inevitably feels that at least between the time when street cars actually utilize the roadway occupied by their tracks the space should remain available for any legitimate traffic purpose. The same objection is not felt where roadways are wide enough to accommodate the full flow of vehicular traffic in addition to the street-car load, but under such conditions there is little need for the prohibition.

The most logical regulation for a relief for the conflicts between street cars and the vehicular traffic stream is to be found in the provision now generally incorporated in city traffic ordinances which provides a right-of-way for street cars along their own tracks. It is expressed in the uniform ordinance for California cities in the following words: "It shall be unlawful for the operator of any vehicle proceeding upon any street-car track in front of a street car to fail to remove said vehicle from said track as soon as practicable after signal from the operator of the street car." This provision, adequate

*Abstract of an address delivered at the annual convention of the American Electric Railway Association, Cleveland, Ohio, Oct. 3 to 7, 1927.

enforced, protects the street car from unreasonable "ragging" by preceding vehicles.

A further type of vehicular interference is to be found in the standing of vehicles on the track to the left of passenger loading zones while awaiting release at the adjacent intersection. The orthodox solution for this difficulty is to require all vehicles to pass to the right of such zones, on the presumption that this rule will always make it possible for street cars to reach the loading berth over a clear track. This is undoubtedly a desirable rule on streets with a roadway of adequate width to carry the full load of vehicular traffic without the use of track space.

Where vehicular traffic is too heavy to be accommodated in the off-track space available, it should be pointed out that the rule generally has more serious effects upon traction operation than no rule at all. The space to the right of the passenger loading zone is generally less than the traffic space to the midblock. An attempt to crowd a heavy vehicular flow into this bottle neck often makes it impossible for some vehicles to clear the track. The

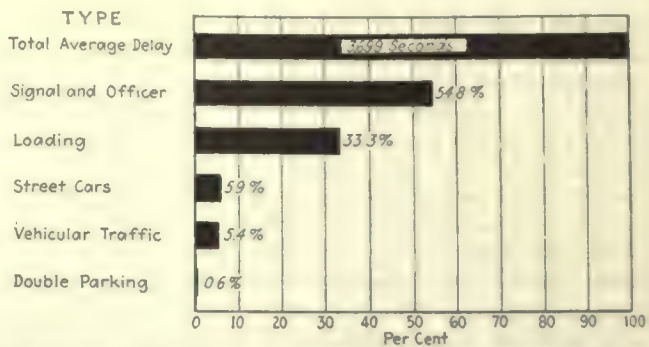
CAUSES OF DELAYS ON STREET CAR LINES IN LOS ANGELES			
	Per Cent		Per Cent
Signal and officer.....	54.8	Vehicular traffic.....	5.4
Loading.....	33.3	Double parking.....	0.6
Other street cars.....	5.9		
			100.0

result is that obstruction to the street car is merely transferred from a point near the loading berth to a point farther back, where it may be even more serious to operations. Indeed, it is not unusual to see this type of obstruction extend its effect back to the next intersection, interfering with cross traffic at that point.

The traffic condition that is most generally accused of contributing the principal delay to street-car operation is parking. For consideration here, parking may be divided into two types: First, parking along the curb, and second, double-line parking. It is apparent that curb parking has little effect upon street-car operation except on streets with roadways so narrow that automobiles so parked obstruct the overhang of the street car. Under such conditions it is clear that parking, and even the standing of vehicles for loading and unloading, must be entirely abolished, or street-car operation abandoned.

On streets where the roadway is so narrow that there is not room for the operation of a line of automobile traffic between the street car and parked machines, it would at first appear that prohibited parking would immediately result in improved traction operation. Undoubtedly some relief would be obtained, but not to the degree frequently expected. Even with time-limit parking prohibited, provision must still be made for the loading and unloading of passengers and merchandise. Under normal traffic conditions in typical cities, this requirement will generally result in at least one such loading vehicle being found in each block. In other words, the amount of vehicular operation along the car tracks will not be substantially reduced, inasmuch as drivers will not permit themselves to be "boxed" in the line of traffic nearest to the curb.

Such operating advantages as may come from prohibited parking are to be found primarily in the elimination of the necessity for what may be called double-line parking, which, on all streets except those of unusual width, results in a blocking of traction movement. Where time-



Segregation of total average delays observed on twelve street car lines in the central traffic district of Los Angeles by the Traffic Commission of the City and County of Los Angeles

limit parking is prohibited, double-line parking becomes unnecessary, due to the free curb space which is made available for loading and unloading activities. The question naturally arises as to whether it is possible to accommodate loading and unloading operations of vehicles without going to the extent of entirely prohibiting time-limit standing of vehicles. Except in the more congested American cities where a great percentage of the traffic is of a commercial character, it is believed that this end can be obtained by means of a regulation which has come to be known as the loading-zone rule—that is, an ordinance provision which makes possible the reservation of adequate curb space conveniently located in each block, which may be used exclusively by vehicles which are loading or unloading passengers or merchandise. This regulation has proved its effectiveness in eliminating the necessity for double-line standing. Attention is called to the accompanying illustration, indicating that the recent Los Angeles survey revealed that only 0.6 per cent of the total delay time could be attributed to parking which overhung the car clearance line.

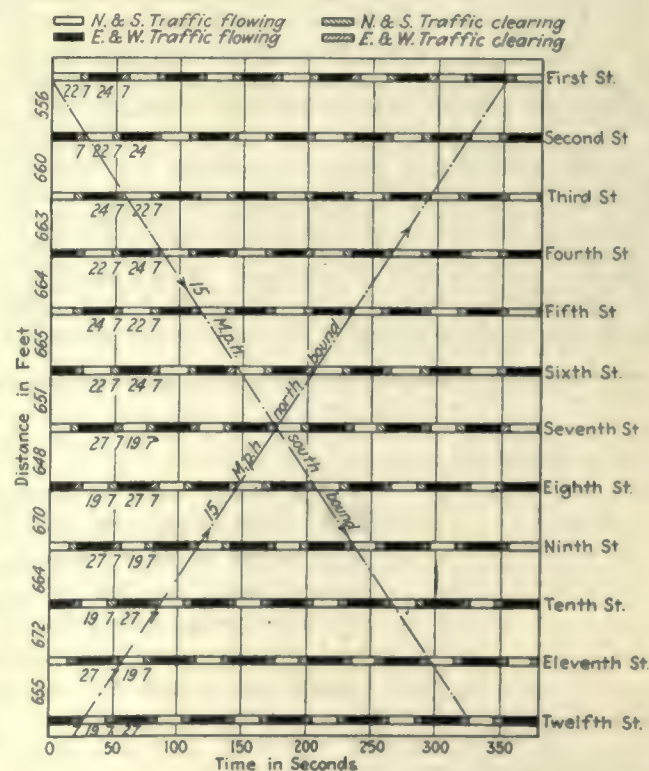


Chart showing operation of recently designed co-ordinated traffic signal system for Los Angeles

Obviously, this delay is so small as to be practically negligible. Yet three years ago a similar study indicated that 10 per cent of all parked vehicles in the central district was standing in double line, causing constant blocks and delays to traction operation. The practical elimination of this delay factor was due to a loading-zone provision incorporated in the traffic ordinance which permits the reservation of as much as 50 per cent of the entire curb space of any block for the use of vehicles during loading and unloading operations. It is needless to say that the regulation has proved of as much benefit to the general motoring public, and especially to the commercial operators of the city, as it has to the street-railway company. A similar provision has been incorporated in the Chicago Traffic Ordinance and the ordinance recently drafted for San Francisco. With double line parking eliminated, the street car operator need have little further consideration regarding parking as a delay factor, except upon streets where curb parking interferes with street car clearance.

DELAY DUE TO OVERLOADED LINES

The delay due to overloaded lines is that which results from street cars offering obstruction to those following, due to overloaded lines or other operating conditions. It is one that does not result from general traffic conditions, but from operating conditions of the lines themselves. Observation leads to the belief that there is in American cities altogether too much of what may be called traditional street-car routing—that is, routes which are followed at the present time primarily because of antiquated habits on the part of the car riders and of merchants located along the lines. Recent routing studies have indicated the possibility of more evenly distributing some of the acute loads which are borne by lines at the present time and at the same time giving more economical and efficient service to the public. Any movement of this sort is a benefit not only to the traction company itself but likewise to the general traffic problem. From the standpoint of traffic relief, special attention should be given, in rerouting studies, to the possibility of eliminating right and left turns at congested intersections.

At Los Angeles 33.3 per cent of the total stopping time was attributed to loading. Methods for reducing loading time are so well known that any discussion of them is needless here. The use of raised platform zones, ground conductors, suitable car design and improved fare collection systems are all important. Observation leads to the belief that in many American cities at present much time could be saved by the use of better methods.

The traction companies owe it not only to themselves but to the operators of vehicular traffic to keep their cars standing for the least possible time consistent with efficient loading. A common view of a street car at a congested intersection with a long queue of passengers boarding laboriously through a single entrance, making change and paying their fare, raises a pertinent question as to whether there is some more effective method of transacting this business. The pay-as-you-leave system as a substitute for prepayment is one which would appear to be a not illogical change under many conditions.

The efficiency of any traffic control system depends largely on its ability to maintain the intersection delay at a minimum. Reference to the Los Angeles table, shown herewith, shows that 54.8 per cent of the total delay can be attributed to waiting for a "go" signal after the loading and unloading business has been completed. This amount of delay seems entirely out of proportion when it is recalled that it exceeds the combined delay resulting from loading and all traffic interferences. Excessive delay from stop and go apparatus will be inevitable in all American cities until the controlling devices are properly co-ordinated and adjusted in timing to meet the traffic loads which the streets carry. What can be accomplished by a properly designed system of co-ordinated control is best illustrated in the Loop district of Chicago, where a co-ordinated system of signals operating under progressive timing has reduced control delay to a minimum and has resulted in a marked improvement in traffic conditions, from the standpoint of both traction and free wheel operation. E. J. McIlraith, staff engineer of the Chicago Surface Lines, is primarily responsible for the excellent design and functioning of this system. As an illustration of what may be accomplished by proper signal co-ordination, an accompanying chart shows the operation of a recently designed system for Los Angeles.

One of the most serious traffic conditions that confront traction operation, and indeed vehicular operation as well, at the present time is what may be called overcontrol. There appears to be a tendency to conclude that a traffic stop and go signal is a panacea for all traffic ills. One sees devices installed at hundreds of intersections in American cities where traffic demands do not warrant control of any type. Traffic signals properly used offer one of the brightest hopes for effective regulation, but misused they can have nothing but serious effects. No signal should be installed at any intersection until a study has indicated that its operation will reduce rather than increase congestion.

WHAT can be accomplished by a properly designed system of co-ordinated control is best illustrated in the Loop district of Chicago, where a co-ordinated system of signals operating under progressive timing has reduced control delay to a minimum and has resulted in a marked improvement in traffic conditions, from the standpoint of both traction and free wheel operation.

The Ten-Year Budget*

*Electric Railways Must
Plan for Years Rather than Months*



By George E. Frazer

*Frazer & Torbet
Certified Public Accountants
Chicago, Ill.*

IN EVERY one of its branches the public utility business is pre-eminently a long-term business. Although certain factors have led to a great emphasis in accounting and reporting by daily and monthly periods, it is well to remind ourselves that we are in a business that of necessity covers long periods.

Every electric railway has on its books a long-term budget expressed in its capitalization. The first problem that confronts the management of an electric railway every morning is the recurring problem of fixed charges on capital. Often the fixed charges are in excess of the net income that can reasonably be estimated. There is the constant temptation before the manager of electric railways so situated to impoverish service and with forced savings from operating necessities build up sums required for interest and dividend payments. It is to the everlasting credit of your industry that this temptation, while daily recurring, is being constantly withstood in order that the public may be served first. Ranking equally in importance with the long-term budget of capital charges is, of course, the long-term budget of capital expenditures. Let me remind you that a budget is a balance. It is a misnomer to speak of a capital expenditure budget if it is nothing but an estimate of the sums that the engineering department of your street railway would like to spend for capital account during each of, say, the next ten years. Opposed to the list of capital expenditures in sub-total and in grand total there must be a statement of proposed capital available out of which the expenditures can be met.

The long-term budget of capital expenditures leads locally to the long-term budget of capital charges. Here, again, it is idle to make a one-sided budget that

merely shows the demand of capital charges that it is estimated will occur each year for a long-term period. Opposite to that demand, and balancing with it, there must be a statement of estimated income available for capital charges. Nor can we break our chain of logic at this point. We must relentlessly set down a third long-term budget. On the one hand we must state the estimate of net income that is required for capital charges and against that estimate we must state the estimated gross revenue, less expenses, that produced the net income. Lest it be said that I am getting into the realm of the higher mysticism at this point I must insist that it is possible to estimate the gross income of an electric railway for a number of years in advance, and it is possible to make this esti-

mate with a reasonable degree of accuracy. Such estimates have been successfully made and can be successfully made, because there are more factors which can be predetermined than there are unknown factors, and because the work of the accountants, statisticians and engineers can be, and should be, tempered by the mature judgment of executives. The priceless ingredient in a long-term budget is the mature judgment of executive leadership that conservatively analyzes the figures and temperately sets down results which are obtainable and in practically all instances will be exceeded. Such figures may be of poor quality if intended for use in selling an electric railway, but should be of exactly the character I have described if they are to be used in planning ahead the successful operation of an electric railway over a term of years.

LONG-TERM BUDGETS SHOULD BE SET UP

Certainly experience has shown that setting up long-term budgets often results in disappointing figures that must be faced if long-term success is to be had. If the capital expenditure budget for the next ten years in

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your company results in a budget of capital charges for the next ten years that demands net income for that long-term period in excess of what the net income can conservatively be estimated, then you have very striking proof of the necessity for long-term thinking. Similarly, a disappointing long-term budget may, and often does, call attention to the necessity for cuts in operating expenses. If the long-term budget shows that present wage rates cannot be maintained, that showing of itself may stiffen the backbone of the management in insisting upon wage rates that can be lived with. It is easy to give in to solutions which make peace for today. In fact, it is altogether too easy to do that in making wage settlements where long-term budgets are not on the desks of the management compelling long-term thinking. And, of course, the long-term budget does play hob with extravagance in overhead expense accounts.

The trilogy of long-term budgets in the case of an electric railway company always emphasizes that present capital charges are so high that it is difficult to add new capital charges made necessary by needed capital expenditures. The temporary solution of some companies has been to forego current capital expenditures, with the result that service has suffered and gross revenues have declined. It is sometimes almost too easy to explain such decline of gross revenues as due to automobile competition. On each successful electric railway in the country the capital expenditures have resulted in improved service and that improved service has resulted in a sufficient increase of gross revenue to meet the capital charges arising out of the capital expenditures. To the degree that this statement is true, it follows in severe logic that the increase in capital charges is more important than the old capital charges, and that the increase in capital charges if necessary must be made, even though the old capital charges are summarily decreased.

The long-term budget tends to bring up the question of recapitalization. To my mind that is the virtue of setting up a long-term budget. Many electric railway companies in the country need recapitalization in order that present capital charges may be reduced to a point where new capital charges can be increased. Without this process the present capital charges themselves are doubtfully secured. Let me add that public financing has demonstrated that the public will buy new securities on an electric railway when satisfied that the old capital charges and new capital charges make a sum total that can be conservatively met.

A long-term budget starts with an estimate of capital expenditures for a period of years. Such an estimate brings into sharp relief the varying degrees of productivity of the properties owned by the electric railway company. If the electric railway company owns power plants and transmission lines which need improvement and betterment, it may be found practicable and desirable for a reorganization of the company to proceed under which such power plants and transmission lines are sold to electric light and power companies which, through more constant use, can better afford to pay for their renewal and expansion. Under this process, the electric railway company can secure power by lease and at the same time avoid capital expenditures which it is not in an economic position to finance.

It must not be understood that the sale of the power plants and transmission lines is indicated in all cases by merely setting up a long-term budget. Quite the con-

trary may result. The long-term budget may show that a great deal of capital must be spent on power plants and transmission lines and that the electric railway company must find an outlet for power in order to justify such a plant program.

The point that I am making is that the long-term budget compels the balancing of capital expenditures with capital charges in the first place, the balancing of capital charges with net income in the second place, and the balancing of net income against predetermined operating conditions in the third place. Where these three judgments are made over a period of ten years in the case of an electric railway property, there is bound to be an intensive study of the revenue-producing qualities of the assets of the electric railway. If the electric railway company owns freight lines or power houses or transmission lines or terminals that it cannot properly finance and develop, then the long-term budget will suggest the sale of these facilities to other public utilities, with advantageous leases back to the electric railway company. On the other hand, if the facilities owned by the electric railway company are capable of expansion where power or service can be sold by it to other utilities, then the long-term budget will suggest that possibility.

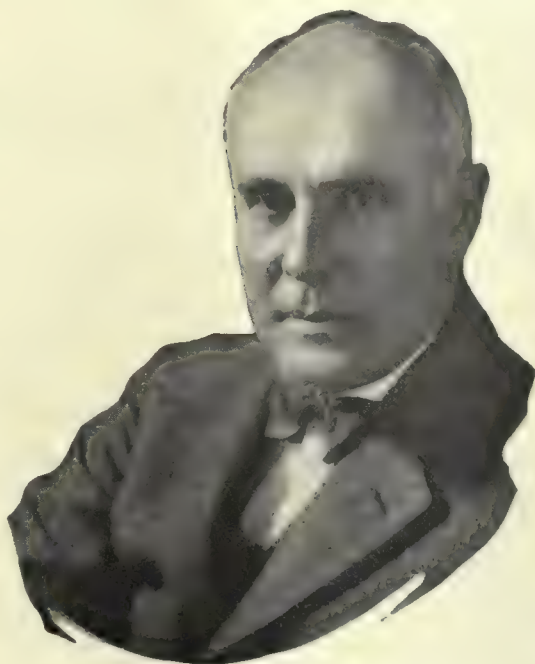
What I have desired to do is to call your attention to the following principles:

1. The electric railway business must be planned in units of five years or ten years rather than in units of this day or this month.
2. The electric railway business is a fundamental part of the transportation system of the country and, as such, is bound to grow and develop.
3. Each electric railway company must spend large sums on capital additions or else suffer losses in gross revenue and jeopardize present capital charges.
4. The proper budget of capital expenditures must be balanced against new capital required to make the expenditures.
5. This leads to the second budget of capital charges, both present charges and new capital charges as against probable net income during the life of the capital charges.
6. This consideration of capital charges may lead to a reorganization of present capital structure in order to secure a basis that will support the required capital structure.
7. The second budget of capital charges leads to a third budget of estimated net income as against gross revenues and expenses.
8. This long-term operating budget draws particular and intensive study to revenue-producing capacity of present and proposed assets, possibilities of increasing gross revenue and decreasing expenses through economies in plant betterments and better supervision, long-term consideration of wage levels and long-term consideration of overhead expense accounts.
9. The three long-term budgets taken as one long term program inevitably lead to a study of the advantages of disposing of such power plants, transmission lines, terminal facilities, and the like, as can be used to better advantage by electric light and power companies than they are now being used by the electric railway company; rehabilitation of the electric railway to put it in a position to sell power to steam lines for electrification of their metropolitan services, and use of electric railways themselves in hauling city freight deliveries so as to reduce vehicular traffic congestion in the city streets.

Obtaining Capital for Electric Railways*

By Francis H. Sisson

Vice-President Guaranty Trust Company of New York



Francis H. Sisson

TO ATTRACT capital, any industry must be able to demonstrate its fundamental economic soundness—that is, its capacity to produce the better than any other agency goods or services for which there is every prospect of continued and enduring demand. From the standpoint of the basic requirement, the electric railway industry, at least in so far as it pertains to transportation in large centers of population, has abundantly proved its right to share in the investment fund of the country. Within the past ten or fifteen years several rival methods of transportation have been developed and tested, but none has proved capable of handling mass passenger traffic as cheaply and as effectively as the street railway. First there came, in the period before the war, the jitney, which, unregulated and irresponsible as it was, soon passed from the scene. During the war the electric railways were weakened by the rapid rise in operating costs, and since its close they have had, in their weakened condition, to face the widespread development of the motor bus as a transportation agency and also the rapid multiplication and diffusion of the private automobile among all classes. Out of the experience derived from this intense struggle for existence of rival means of transportation has come the definite conviction that, for the economic handling of passengers in mass in our cities, nothing has been developed which can take the place of electric cars running on steel rails.

It has become self-evident from the congestion in our streets that the private automobile is incapable of handling the large volumes of traffic which daily flow to and from the business centers of our cities. As the congestion increases, owners find that they cannot by using their automobiles save sufficient time over street car schedules to justify the very substantial additional expense involved. They are also deterred by the vexation and dangers of driving in crowded traffic and the difficulty of finding parking spaces in the vicinity of their destinations. It seems likely that further multiplication

of automobiles will have little adverse effect on the volume of traffic carried by street cars in rush-hour periods in large cities, although there may be some resulting further decrease in riding during off-peak hours and on Sundays.

While the private automobile has not displaced the street car, it has admittedly modified to a profound extent the conditions under which street cars operate. For one thing, the speed of street cars has been reduced by the congestion which the automobile has produced. Another change has been the lowering of average volumes of street railway traffic as compared with peak volumes. Both of these alterations in conditions have made for increased unit operating costs on the railways. These changes, however, are of the technical variety. Broadly speaking, the most

significant modification has been that of the electric railway industry from a monopolistic to a competitive business. No longer can the railways depend on traffic which comes to them as a matter of course; instead, they must adapt their operations and equipment to attract traffic.

These adverse changes in operating conditions for street cars, however, have been counterbalanced by even more adverse changes in the conditions affecting the use of automobiles and consequently have not shaken the conclusion that the electric railway industry in large centers of population is as a business economically sound. As this judgment respecting the permanence of street railways comes to be shared by investors generally, the difficulties in the way of railway financing should become much more easily surmountable.

At present, however, despite the soundness of the railway business as an economic activity, many railway companies are hard pressed to obtain additional capital for their needs. The main reasons for the plight of these companies are unsatisfactory franchises and contractual relations, top-heavy indebtedness and fixed charges, closed or otherwise inflexible mortgages and in some instances competition from other public transportation agencies, unfavorable political conditions, unsatisfactory public relations and lack of alert and efficient management.

*Abstract of an address delivered at the annual convention of the American Electric Railway Association, Cleveland, Ohio, Oct. 3-7, 1927.

Speaking very generally, the inability of these companies to do financing is due to the fact that the essentially sound business which they conduct is not clothed in sound legal and corporate forms. For the most part the existing inadequate forms which retard and prevent financing are not creations of present managements, but are rather legacies from a past in which conditions were utterly different.

Among the most common difficulties encountered in franchises are insufficient term or tenure of life and lack of flexibility in respect to fares. Either one of these conditions makes financing well nigh impossible, and a combination of the two is usually fatal. Fortunately municipal authorities and the public in general have in a number of instances been brought to see the folly of inflexible provisions in these matters, and old iron-clad franchises have been superseded by others having the flexibility that investors demand.

Unless state laws prevent, franchises should be for an unlimited or independent period, or else there should be some provision for the amortization or reduction of debt within the period of the franchise. Several states have commendable indeterminate franchise laws whereby public utilities are assured of the continuing right to operate their properties unless and until the municipalities within which the properties are located elect to purchase them at their fair value. Other states should follow suit and rid their statute books of archaic franchise laws. Where franchises must be for definite terms, the necessity for amortizing debt within the life of the franchise may be obviated if a provision is incorporated obligating the municipality to take over the property at its fair value in case the franchise is not renewed.

FRANCHISES SHOULD PROVIDE FLEXIBLE FARE

Unless the regulations of fares falls within the province of some state-wide agency, there should be machinery within the franchise itself whereby the raising and lowering of fares to meet fluctuating costs is accomplished automatically and without reference to any local political body. A number of admirable "service-at-cost" franchises embodying this principle have been worked out. In such franchises changes in fares usually are regulated by a barometer fund into which go all earnings above expenses and a stipulated return on capital. The only serious criticism which may be made of such franchises—and that mainly from the standpoint of the common stock holders—is that the incentive to the management to accomplish savings in operation is somewhat dulled, since such savings redound wholly or largely to the benefit of the car rider. As a way of avoiding this difficulty, it is suggested that companies which have occasion to work out franchises in the future might give consideration to the possibility of making the raising and lowering of fares dependent upon price index numbers rather than upon barometer funds. Index numbers have proved useful in many ways, and it should not be at all impossible to construct one which would fairly measure

fluctuations in the costs of conducting electric railway operations. Entering into the computation would be wage scales for various general classes of labor and prices for the principal basic commodities and materials used in the operation and maintenance of street railways. The level of the index number prevailing at the time of the adoption of the franchise would be taken as 100, and provision would be made for the increase or decrease of fares by some fraction of a cent for each 5 or 10 per cent increase or decrease in the index number. The regulation of fares in this manner would not impair in any way the incentives for increased operating efficiency.

Another common defect in franchises is the heavy burden of paving charges and taxes which they impose upon the grantee companies. The reasons for the requirements in regard to paving have been obsolete ever since the passing of the horse cars, and ordinarily there is scant justification for any special franchise or excise tax on earnings in addition to the usual property tax. In the

long run the effect of such provisions is to raise the fare which the public must pay and by so doing encourage the use of private automobiles with resulting increase in street congestion.

The only remedy for unsatisfactory franchises is, of course, the securing of better ones, a process in which the confidence and good will of the public are absolutely essential. To obtain such confidence and good will a company must fully and

frankly acquaint its public with its problems and aims. It must also show, not merely by words but also by actions, that it is doing its best to render good service and will make improvements as rapidly as its position will permit. The obtaining and holding of public good will is a task at which the entire staff of a company, not a part, must work, and work continuously. There is hardly ever a case of public mistrust and ill-feeling that will not yield to continued treatment of this very sort. There is in this connection a vicious circle: Additions and improvements cannot be made because of lack of capital, capital cannot be obtained because earnings are poor and earnings are poor because the inability to make additions and renewals results in high operating expenses and loss of traffic. If this circle is to be broken, it is usually by improving the relations of earnings to fixed interest requirements and in this way making possible the sale of additional securities.

WHEN NO MARKET FOR SECURITIES EXISTS

Companies which cannot at present find a market for their securities might adopt one of two courses: either plow back all surplus earnings into their properties for a period of years and by this process gradually effect such an improvement in the relation of earnings to interest charges that bonds will become salable, or else endeavor to effect a readjustment in capital structure. The first procedure should not be followed by a company unless its surplus earnings, together with such funds as it is able to secure from the sale of equipment trust certificates and similar obligations, are entirely sufficient to take care of its needs for new capital, not merely the

WITH favorable conditions in respect to franchises and corporate structure must be coupled the assurance of alert and vigorous management, for not even the best set-up as to franchises and capital issues will atone for visionless and inefficient supervision.

—FRANCIS H. SISSON.

money required to maintain the property in its existing conditions but also that needed to revivify it with new equipment and place it in a condition to attract traffic. If a company's earnings are adequate for this purpose, however, its credit may be restored by this process much more quickly than might at first be thought, as the effect of the reinvested earnings is cumulative.

If, however, earnings are not sufficient to keep the property abreast of developments, then it is best for all concerned, security holders as well as car riders, that a readjustment should be undertaken. In some cases there could be a fair possibility of effecting such a readjustment by voluntary agreement among the holders of the various classes of securities. Almost any street railway property which has been starved for lack of capital will pay a handsome return, in the way of increased earnings, if any new money which may be introduced. For this reason it should not be impossible to persuade holders of existing securities to see that their interests are better served by taking junior securities in a situation with good prospects of growth than by preserving a technical priority on a starving property. There will be cases, however, in which voluntary action cannot be secured and where the knife of forced reorganization must be used. Even when this means the wholesale scaling of debt and the levying of assessments on stock, all classes of security holders are likely to find in the course of a few years that, as a result of the improvement in their company's credit, their new securities are worth more than those which they surrendered.

Of course, there may be more than a mere situation in respect to earnings that prevents a company from being able to do financing. In addition to being top-heavy, its funded debt may be complicated by reason of being split up into numerous separate issues and also its principal mortgages may be closed so that it has nothing resembling a first mortgage with which to go into the money market. Even in cases where mortgages are open there may be difficulty because the bonds which may be issued must bear a particular maturity date or coupon rate. Whenever opportunity offers, whether in connection with a readjustment or otherwise, a new financing medium should be set up which will be as nearly as possible a first mortgage, permitting the issuance of bonds in series varying as may be desired in respect to maturity dates, coupon rates and other provisions.

Even when a company has been placed in a position where it can do senior financing satisfactorily, it may still have a problem on its hands to raise its requirements of junior money. Few companies are able to sell stock, and recourse must therefore ordinarily be made to earnings as a source of junior money. Perhaps most companies will have to continue this practice for some time, but at the very first opportunity they should undertake the sale of stock. In preparation for such an opportunity they might, wherever legally possible, change their stock into shares without par value.

With favorable conditions in respect to franchises and corporate structure must be coupled the assurance of alert and vigorous management, for not even the best set-up as to franchises and capital issues will atone for visionless and inefficient supervision. On the other hand, it is really astounding to find how much can be effected by good management alone in the way of reducing operating expenses and working out improvements to attract traffic.

Present Situation Is Encouraging*

By B. C. Cobb

Chairman of the Advisory Council
American Electric Railway Association



B. C. Cobb

Despite increasing automobile competition, the electric railway industry is holding its own. Modernization of plant and modernization of thought are instrumental in making it progress

WE ARE again deeply appreciative of the hospitality extended to us by the city of Cleveland and its people. Ours is a great and necessary industry, as the citizens of Cleveland well know. Because of their wise action after some years of experiment, their city has today one of the best-operated and most strongly financed transportation systems in the country. Some other places would do well by emulating this example. New York, where politics and not service to the public is the order of the day, would profit by giving heed to what has been accomplished in this fair City of the Lakes. In our great metropolitan center, votes, not transportation service, seem to be the things uppermost in the

*Abstract of an address delivered at the annual convention of the American Electric Railway Association, Cleveland, Ohio, Oct. 3 to 7, 1927.

minds of the granting and regulating authorities. And yet here is a paradox, for if the people were properly told and understood, it seems certain that they would see that the 5-cent fare will not earn in sufficiency properly to maintain and give adequate service and would therefore vote for something different.

I think I can fairly say, without fear of contradiction, that the transportation service in New York City today is a crying shame. And why? Politics, and the desire to "fool all of the people all of the time." A unified and improved transportation system under private management, with a slightly increased fare and with proper governmental regulation, would solve the problem, and with great benefit to all concerned.

In 1926 there was no appreciable increase or decrease in the number of passengers carried by electric car and allied motor bus lines. The figure has been almost stationary for the past three years—16,000,000,000 revenue and transfer passengers. Perhaps we should feel encouraged because of this. I mean perhaps we should not become discouraged because of lack of increased traffic when we know that our country has increased in population prodigiously during the years just mentioned. I do not think we should become discouraged when we consider the tremendous increase in privately owned and operated automobiles during that time. Somewhere between 10,000,000 and 11,000,000 is the figure.

The independently operated motor bus is not now the menace that it was, for the industry itself has, to a very great extent, taken over that very necessary adjunct of the transportation service. Happily for the industry, for the bus manufacturers and for the people themselves, a better understanding of the bus situation has been arrived at. The financing of independent bus operation by manufacturers in localities already served is largely a thing of the past. This is for the common good, for ruthless competition in a business which should be a regulated monopoly can only work harm for all alike. We of the electric railway industry should not, however, complain if bus or other transportation service is given in territories needing service if we ourselves decline to give it.

IMPROVED SERVICE AND NEW METHODS

No one, if fair minded, can say that the electric railway industry has not in the past few years endeavored to better its service. This is the one thing it has tried to do, not because of altruistic impulse—I think no such claim has ever been made—but because if it was to live and eventually to prosper, it was necessary to renovate its viewpoint and adopt new methods and procedures. This it has very effectively done, not only by adding new and modern railway equipment but by adding motor bus auxiliary service, paying more attention to its personnel, giving the public more complete information as to its needs and necessities, and above and beyond all else, endeavoring to render a service under the most trying circumstances in a gracious and attentive way.

The industry has been courageous in the face of great difficulties. It has steadfastly maintained that it is rendering a necessary service to the people. It has tried frankly to express just what its troubles are and what it needs to make it prosperous and therefore a better servant of the public. Its efforts at salesmanship during the past few years have been noteworthy, with the result that in many instances much good has accrued not only to the industry but to the people as well. It is very gratifying

to report and be able to say that, generally speaking, most of the communities—there are a few exceptions throughout the country have rallied to the support of the industry and endeavored to help it, not only by increasing rates of fare but in many other ways. This is a good sign, for it means co-operation and team work which in the long run must surely win.

ADVISORY COUNCIL PRINCIPLES

Last year your advisory council laid down some fundamental principles which it was thought would be of benefit not only to the companies but to the employees and the public as well. These principles your council stands for, and it believes if they are followed they can not help but be of benefit to all alike. The most important of these are:

1. The companies must obtain the friendly co-operation of the public.
2. The companies must have their executives always accessible to their employees and the public. They must welcome suggestions made in the interest of the service, grant reasonable requests and have a genuine interest in the welfare and progress of the communities in which they operate.
3. The employees must realize that their interests are those of the company are the same, and make every effort to be useful public servants in an honest endeavor to make friends for themselves and their company.
4. The public must favor a just system of regulation and consent to rates of fare that will make its transportation agent a solvent industry.
5. The public must understand that the best service at the lowest cost can be obtained in a community only through the operation of all public transportation by an efficient organization.
6. The public must realize that 75 per cent of the people use the public transportation service in their daily occupations, and insist that their authorities enact and enforce such effective traffic control that the public vehicles may have a relatively unobstructed use of the streets.

Indiscriminate and unregulated parking of automobiles on business thoroughfares is an evil which still exists and it is evident that only with the passing of time and better acquaintance with the results of such evil will it be stopped. Not only is such practice harmful to the transportation companies but it is also harmful to the merchant whose front door it clogs. It slows down traffic because of so doing becomes a public nuisance. If continued, it can only mean additional and unnecessary taxation because of the cost of widening streets.

GOVERNMENT OWNERSHIP

There are some among us who are favorable to government ownership and operation of public utilities. There are not many, however, for the feeling in America, which is the outgrowth of the thought expressed in the Constitution, is still too strong for private initiative and endeavor. And yet, if the people want to continue to keep electric transportation in city and suburban service I cannot think otherwise—it may be they will be forced in extreme cases, to take over such operation, charge such deficits as may come about to the taxation burden. A better thing, and a more likely thing, will be for the people fairly to regulate and compensate their transportation companies so that they will earn a fair return on the fair value of the property used and useful in public service.

The Autobiography of a Thin Dime*

By E. F. Wickwire

Vice-President Ohio Brass Company, Mansfield, Ohio

This is one of the author's characteristic addresses, containing a wealth of philosophy with a 1928 model dress that is planned to please his auditors, much as he would have them please by dressing up their cars



E. F. Wickwire

"I am a Dime—Ten Cents
"I am not on speaking terms with the Butcher
"I am too small to even look at a pint of Ice Cream
"I am not large enough to purchase a good Cigar
"I am too small to buy a ticket to a Movie
"I am hardly fit for a Tip
"But, believe me, when it comes to Street Car Fare
"I am considered *Some Money*."

PERHAPS you've heard the story of the sailor who was visiting his boyhood chum who had become a minister. The sailor had a parrot. The minister also had a parrot. The parrots were hung up side by side. They looked at each other for a minute and each was suspicious of the other. Finally the minister's parrot, in a funereal voice, said:

"What must we do to be saved?"

The sailor's parrot thought that over for a minute and then remarked:

"Pump like h——, or we'll all be lost."

I think the question asked by the minister's parrot strikes a familiar chord in the minds of all of us connected with the electric railway industry. We have been trying to work out the right answer to that question for quite a spell.

Maybe you'll agree that the answer given by the sailor's parrot to the minister's parrot pretty nearly hits the nail on the head.

The next question that perhaps naturally comes to mind is: "Are we steering the 'old boat' in the right direction to reach safe waters?"

And this is a vital question that concerns everybody connected with the industry—whether he be an operating man or a manufacturer.

Recently I noticed a card displayed throughout a manufacturing plant which read something like this:

"Who is your real boss?"

"Is it the president? No."

"Is it the superintendent? No."

"Is it the foreman? No."

"Your Real Boss is the CONSUMER of our Product—the man who buys the article that you are helping to make.

"If he is satisfied with your Product, he will continue to

patronize you. If not, you will lose his patronage, perhaps without even hearing a complaint from him.

"Furthermore, the quality of your Product is the yardstick by which he measures the price he is willing to pay for it.

"It is not simply a question of satisfying yourself—you must satisfy him.

"At times you may think he's a 'Crank,' so keep this definition of a Crank before you!

"A CRANK IS A FELLOW WHO INSISTS ON CONVINCING ME, INSTEAD OF LETTING ME CONVINCE HIM."

Doesn't this same principle apply to the electric railway industry? Isn't the user of our product—the car rider—the real boss? And isn't it up to us—all of us—to satisfy him in order to progress and prosper?

And if we are really aiming to satisfy this real boss—the consumer—doesn't it stand to reason that we must constantly study his likes and dislikes; find out what appeals to his spending instinct, and do our utmost to develop our product accordingly?

You may say, "That sounds all right, but it's not such a simple matter to read the minds of the fickle public in our case." And I agree with you thoroughly. But I think you agree with me that a determined, intelligent and organized effort on the part of all of us will find ways to accomplish our purpose.

It's a good mark to shoot at—and you know Cleopatra finally "made her Marc."

We might do a lot by establishing scientific research departments. I use the term "scientific" because anything is scientific when we don't quite understand how to accomplish it.

I recently heard a man who has been prominent in so-called scientific research work for improving the automobile make this remark:

"Our constant aim is to find out what appeals to the public; what it will buy, because anything that can be sold can be manufactured."

*Abstract of an address delivered at the annual convention of the American Electric Railway Association, Cleveland, Ohio, Oct. 7, 1927.

Isn't that a significant comment, "anything that can be sold can be manufactured?" And wouldn't we do well in our own industry, both operating man and manufacturer, to dig a little deeper into that point?

I doubt if there is any field in which the mechanical and technical problems have been more intelligently, logically or thoroughly worked out than in the electric railway industry. Hampered by low fares and working under that first fundamental law of railroading—"service must be maintained under every condition"—there is no denying that electric railway men have accomplished wonders.

THE AUTOMOTIVE MAN'S PHILOSOPHY

This automotive man whom I have quoted has evidently studied people from this standpoint. To quote him further:

Every trade in the world hates the introduction of a new idea into its routine, if the idea looks new. Therefore, be careful how you wrap it up. They award medals for a new idea only after it becomes old.

So we must study that end of the thing and the business relationships, the common, every-day, work-a-day things, simply to find out whether we do it by force of habit, whether there is any sense to it or whether there isn't.

So the principal way to start research in any organization is to start at your desk. Turn it 180 deg. around and see how much different things look. Just move a few things around. Go to a different restaurant to eat, or do something differently."

[Suppose in our case he might suggest riding to work on a street car.]

That is all that is wrong with us; we get to doing the same thing in the same way every day and all the rest of the world disappears.

So we have to get out of the rut; that is the greatest problem that research has today, to get us mentally out of the rut, and the rest of the things come as a matter of course.

I have taken the time to quote these remarks from a man high up in automobile research work partly because they appeal to me as very much worth while in themselves and also because the development of the automobile has created an entirely new set of conditions in the electric railway industry.

So, whether we like it or not, the automobile seems to be our principal competition. And a little analysis of some of the ways the automobile industry has appealed to the public in motor transportation may emphasize the importance of some points as applied to our case.

For example, we all know that the "appeal of appearance" has been one of the strongest selling factors in the automobile industry.

Knowing, as we do, that the decided changes and improvements in the lines and appearance of the 1928 model motor car, as compared with, say, the 1918 model, have appealed so strongly to the public, is it reasonable to assume that it will not respond to more of the same kind of treatment, applied to the trolley car? There is a question of degree of course, and this doesn't mean that the trolley car has to look like an automobile, but it should look less like the old, "5-cent" street car.

The motor car industry has not been able to get motorists to adopt the polecat's motto, "don't hurry—others will," so it has made marked improvements in recent years in the matter of quick acceleration, and you will find it featuring this point in its advertising and in its sales talk.

In the matter of comfort, the motor car manufacturer has made constant improvement, even to the point of providing, in some cases, cushions stuffed with "goofer feathers, or fuzz from peaches."

Here, again, enters the question of degree when considering the trolley car, but it doesn't stand to reason that a man is cheerfully going to transfer his pampered anatomy from a wide, comfortably cushioned automobile seat to a narrow, hard-surfaced trolley car seat.

Automotive engineers will tell you that quietness and power do not naturally go together in a gasoline engine and yet they have spent years trying to make the motor as quiet as possible. And it stands to reason that if his nervous system suffers so much from the squeaks and rattles that develop in the motor car, he also has sensitive ear for the grinds and howls that develop in the trolley car.

Last, but not least, we all know that the trolley car that presents a clean, bright, attractive appearance makes a strong appeal to the public.

The motor car has developed one outstanding characteristic in the American public today, and that is impatience. People won't walk, nor will they wait to ride in fact, they can scarcely wait for a traffic signal to change.

Like the little Irishman who was hurrying along in his flivver and was stopped by the traffic officer, who said "Wait! Pedestrians are now passing." After waiting impatiently for a minute the little Irishman yelled to the cop, "Say, when kin a Catholic get past here?"

SPEED, BUT FOR WHAT PURPOSE?

A big percentage of the people today are rushing madly around in motor cars, hurrying to get somewhere, and half of them don't know what to do after they get there. Nevertheless, they demand speed in the matter of transportation, and I believe that most of us have decided that we have to face that issue squarely.

There's no use trying to satisfy the car riders with what satisfies us. We must deliver the kind of a product that satisfies them, or it won't work any better than "trying to amend the Constitution without first amending the people to fit it." Their requirements may seem unreasonable, but is it easier to rebuild the public or to rebuild our product?

These truths bear much repetition; they but confirm what the sailor's parrot said about the necessity for keeping on pumping—"pumping" new ideas into the industry to keep pace with changing conditions.

Why will people willingly pay taxes to provide more and more street space for private cars and then begrudge an extra penny or two to ride on street cars, which carry five times the number of people for a given amount of street space?

At the opening of our county fair the other day police estimated that 10,000 automobiles had arrived and only 2,000 people.

One reason for all this "scotching" on street car fare is because shrewd politicians everywhere have rubbed elbows with and studied this "real boss" that we've been talking about—the consumer of our product. And they know that it's not hard to convince him that he shouldn't pay 10 cents to ride in the trolley car that he used to ride in for 5 cents—or one that even looks like the one he used to ride in for 5 cents.

Yet shopkeepers tell us that the workingman nowadays is buying silk shirts. And the working girl is wearing silk stockings—so I've heard. Cotton stockings at "on their last legs," and, by the same token, "cotton street cars are on their last wheels. And it's a safe bet that the 1928 model shop girl will cheerfully pay 10 cents to curl her 1928 model silk stockings under the seat of

192 "silk stocking" model rail coach if she gets half a chance. And no wise politician would attempt for a minute to tell her that she couldn't afford it.

It most of us realize that modernized equipment alone will not solve our problem successfully. It must go hand in hand with modernized merchandising methods. And it is encouraging to note that the industry as a whole has rediscovered how to sell its service, instead of simply allowing patrons to buy it, as they did in the old "horse-and-buggy" days.

In this connection, the aim of your committee on cooperation of manufacturers is to inspire manufacturers to make a more intelligent and intensive study of the industry's needs, and so stimulate the creation of more new ideas, together with creative selling effort in presenting these ideas to operators.

Not that the manufacturers have not been making improvements. One look at the excellent car exhibit at this convention will offset any such impression. We've made a good start and will undoubtedly create and adopt improvements much faster from now on, particularly in respect to further changes in the lines and outward appearance of the car.

Long ago the automobile industry called in the artist to create new body designs, and the artist may have thought a spark plug was a horse. But he went ahead and beautified the lines of the automobile body. Then the production man was called in, and he said, "It can't be built to look like that." But the executive said, "This is not just an artistic picture; it's a commercial proposition—it must be built"—and they found a way to do it.

There is nothing like calling in the right man when you want something done. Like the Scotchman who wanted to put up a brick building—so he called in a Free Mason.

The next subject on the program this morning is entitled "How the Industry Is Progressing," the idea being to present short talks by operating executives relating accomplishments of the year on properties in various parts of the country.

It has been well said that "the individual today counts for a little in the entire make-up of the industry that only by an exchange of ideas and finding out how little we know, do we go back home and want to learn more. We should all listen to these new ideas and give them our consideration.

We are all pretty much alike as human beings, and every time a new idea is presented we are quite willing to tell what's wrong with it, because it's more fun to throw bricks than to lay them.

But shouldn't we go a step further and say, "Can you overcome that difficulty?" And if you do overcome that one, you may develop another. And if the project is worthwhile, you can go ahead and solve that difficulty—you don't get tired too quickly.

Conservatism has its place, but progress means pioneering. It's all right to "keep both feet on the ground," but you can't walk far if you do.

So let's not be backward about presenting new ideas at these meetings for fear they may sound radical.

Like the Christian Science testimony meeting that I attended recently. There were many enthusiastic talks acknowledging the inspiration and help received from Mary Baker Eddy, the founder of Christian Science.

Finally, a meek-looking little woman in the audience rose and said, "I'm only a visitor here and never heard of Mary Baker Eddy before, but I just want to tell you that Lydia Pinkham has done for me."

Evolution of Regulation and Accounting*

By Harry Boggs

Herdrich & Boggs, Certified Public Accountants,
Indianapolis, Ind.



Harry Boggs

EVOOLUTION means the ascent from simplicity to complexity. This is the history of regulation and accounting.

As most of you are connected with an enterprise that is regulated by law, it might be interesting to know that regulation is not a recent invention or a new discovery.

The difference between private enterprise and public calling are the most salient characteristics of the law of business relations. The causes of these differences are more economic than legal.

In public callings the state imposes affirmative duties, but in private enterprise usually the duties or restrictions are negative in character.

The history of the development of this distinction between public business and private calling show clearly the legal and economic basis upon which the modern law rests. [Mr. Boggs then reviewed some of the regulations in medieval times, pointing out the economic basis.]

[After citing certain classes of business that are now usually considered as public utilities Mr. Boggs takes up the question of why they are so classified.]

The question arises, why these classes of business are

*Abstract of a paper presented at the annual convention of the American Electric Railway Accountants' Association, Cleveland, Ohio, Oct. 3 to 7, 1927.

regarded as public utilities and subject to state regulation, when other businesses are not so regulated. The principal reason is economic. It takes comparatively little capital to open a shop or a grocery store, therefore the field of these callings is practically unlimited as to competition, and competition may be expected to regulate service and prices. But the classes of public utilities hereinbefore named require large investments. To attract the capital required for such investment it is considered necessary in most cases for the state to grant a monopoly; that is, to guarantee the company which provides this service that it shall not be subject to competition in its field and that it shall be permitted to earn a reasonable return upon the fair value of its property actually used and useful for the convenience of the public.

In return for that grant, and in order to prevent the monopoly from becoming burdensome on the public—that is, from charging exorbitant rates, or giving inadequate service—the state makes exact and rigid regulations for the conduct of the business. These are affirmative duties. The state says that the business shall be conducted in a certain manner.

Let us take, for the purpose of comparison, an electric railway utility and any typical private enterprise, such as a merchandising or a manufacturing business.

In the first place the character of a public utility corporation is such that in order to furnish adequate service to the public a very large fixed investment is required.

While this may also be true, to a degree, of some manufacturing concerns, in commercial undertakings the capital turnover occurs several times each year and the fixed investment is relatively not large.

A manufacturing plant may operate when and as long as it pleases those in charge of its affairs. Its products usually can be stored until needed. The capacity of the plant can be adjusted to the demand of the market, but the size and capacity of the plant of an electric utility must be sufficient to meet the highest peak demand made upon it, even though that demand continue but for a short time.

A utility furnishing electric current must be in constant operation and production, 24 hours a day. A utility must serve all who apply and must sell its product without discrimination in price. Those who are engaged in manufacturing and commercial enterprises are not so restricted. They may sell or not sell, as they please.

On the other hand there are certain advantages and privileges which accrue to public utilities which are not shared by those engaged in private enterprise. There are certain legislative restrictions upon competition which inure to the benefit of the utility.

So we find that the determining factors with respect to these matters are economic and not legal and it is an inexorable economic law which governs and controls.

ACCOUNTING IS AN IMPORTANT FACTOR

Now that we have briefly traced the development of regulation, let us talk about the accounting department for a few minutes, to see if there has been any developments worth while and to determine, if possible, just how much importance to industry attaches to this fascinating profession.

[Attention was directed by the speaker to the early methods in vogue when trading was first indulged in by human beings and showed how transactions were recorded then.]

In years gone by many merchants viewed the accounting department as a needless expense and a nuisance. The very first thing that transpires after any new company is organized is to call for an accountant to organize up a set of records, thereafter to be kept in such a manner as will correctly reflect the true condition of affairs throughout its corporate history.

The owners of a large corporation may have a wonderful institution, but they must depend upon the accounting department to keep them posted on the trend of business and warn them of the leaks.

I am sure that no public utility can properly function without a competent accounting department. The department prescribes just what accounts shall be kept and how often, when periodical reports must be made to the commission and the books must be accurately kept in order that the reports will tell a true story.

We all know that the income tax law has been a very important factor in bringing about a wider recognition of the indispensability of the accountant.

Some of the highest executives in our largest industries have come up through the accounting department.

May I leave with you the thought that the accounting department is rapidly mounting to its proper place in the utility field as well as in the commercial and industrial world and must eventually be recognized as the most important and vital factor in every business organization.



Members of the exhibit committee

An Informed Public Is Fair*

By **George B. Cortelyou**

Chairman Joint Committee of National Utility Associations

THE Joint Committee of National Utility Associations had its genesis in war conditions. To expedite the placing of their resources at the disposal of the government and to serve as a means of contact with the government on the larger problems created by the war, the utilities formed several joint committees. The end of the war naturally brought an end to these special duties, but it was thought best to continue some sort of organization that would function in time of peace and that would facilitate common action on questions of larger import affecting the utilities. The present joint committee was the result.

The national utility associations comprise the following: the American Gas Association, the National Electric Light Association and the American Electric Railway Association.

Despite the fact that the country as a whole has accepted and indorsed the policy of private ownership, operation and management of the utilities, ardent advocates of contrary policies appear from time to time with peculiar plans that would involve the government in vast expenditures, whereas every practical feature of their plan—so far as they have any practical features—could be secured, at infinitely less expense, by the normal extension and development of existing private agencies. They would have us believe that government can carry on the business better than those who have grown up in it and have made it what it is today, and this in spite of the wrecks that litter the road over which government operation has traveled in the past. Many of these enthusiastic theorists are less concerned with the success of their particular project than with gaining an entering wedge for their paternalistic ideas.

The American people want to be just and fair. Of that there can be no question. They have proved it time and again both in their domestic affairs and in their external relations. Temporarily they may be misled by rejected and partial information, they may follow false leads for a time, but in the long run they reach sound conclusions.

The price of liberty is the freedom to make mistakes. While it is true that the people may be trusted to reach sound conclusions in the long run, if the run is too long, irreparable damage may be done before the situation can be rectified. Surely we are justified, then, in attempting to avoid this by pointing out the errors and fallacies involved in many of the proposals affecting the utilities

Abstract of an address delivered at the annual convention of the American Electric Railway Association, Cleveland, Ohio, Oct. 6-7, 1927.



George B. Cortelyou

that are urged from time to time, by disseminating reliable information concerning them and by endeavoring to keep the line of progress as straight and unbroken as possible.

There is neither mystery nor hidden purpose in the program of the joint committee. Its work will be carried on openly and frankly. It seeks no favors; it asks only that its presentation of the utility situation be considered and dealt with on its merits. But that such presentation may be so dealt with, it exercises the common right of all American citizens or organizations to be heard on all matters in which they are interested that become the subject of public debate or decision, and having presented its case it will, with confidence, abide the informed judgment of the people.

We believe that an informed public is a just public. We intend, therefore, to give the public the truth about the utilities, their aims, their hopes, their difficulties, their accomplishments. We shall try, among other things, to demonstrate that the entry of government, whether national, state or local, into this field is constitutionally unsafe, politically unwise, economically unsound and competitively unfair. And this we shall do, not wholly from the selfish standpoint, but because it is the obligation of every good citizen to fight the spread of theories which, if adopted, would undermine the structure upon which our national progress is founded. We believe that we can so present the outstanding merits of utility service under private ownership that an informed public will be unwilling to abandon the solid ground of that system for the quicksands of government ownership.

Although the utilities as a class are rightly regarded as among the most stable of our industries, they are by no means exempt from the effects of changing conditions and the necessity of adapting themselves to them. Periods of readjustment are always difficult and often painful. The dislocations caused by the war, with costs far out-

stripping rates, were a severe trial to the utility interests, but they met the situation with faith and courage. The aftermath of the war brought its problems also, and these too are being met in the same spirit.

Among the ever-present facts of the utility situation is that of competition. In the case of the gas and electric companies, this is largely indirect, except in the great and growing industrial field. Gas, especially, must meet the competition of other fuels such as coal and oil where heat is required in industrial operations. The electric company, in its wholesale department, deals with similar conditions. Of course, both are legal monopolies in the sense that there is usually but one gas company and but one electric company serving a given territory, and to this important extent they are relieved of direct competition.

When we come to the electric railways, we find the competitive situation greatly intensified. The phenomenal increase in the use of the passenger automobile, the bus and the truck reacted with serious consequences upon the electric railways, both urban and interurban. They were faced with grave losses, many were forced into receiverships, and many miles of track was abandoned. Had they outlived their usefulness, were they about to disappear from our streets and highways and take their place among the relics of an age that had passed? To these questions many were prepared to answer in the affirmative and were getting ready to sing the "swan song" of the electric railways, just as in earlier years there were those who doomed the gas industry to extinction when it lost the major part of its lighting load to electricity. But happily in neither the one case nor the other were the prophets of evil justified by the event. Just as gas recovered from its temporary setback and marched on to triumphs undreamed of in that early day, so the electric railways, now that they are getting their "second wind," are gradually working out of their difficulties and are more than holding their own. Public opinion, which at first was inclined to be somewhat apathetic, is now awakening to their value as a means of economical mass transportation.

Much of course remains to be done. Their credit must be restored, which can be accomplished only by larger earnings, and this in turn may call for further revision of fares in some instances; equipment must be modernized, better business and accounting methods must be adopted, service must be improved, discriminatory taxes and other oppressive exactions must be abolished, and so on. All agencies of transportation, whether street railway or bus, must be so co-ordinated that unnecessary duplications of service and facilities will be avoided.

Substantial progress is being made along most of these lines. The important thing is not so much the speed at which we are traveling as the direction in which we are going. The electric railways are headed in the right direction. Their return to the place that is rightfully theirs in our transportation system will be hastened if they are protected from the type of competition that is merely destructive in its effect and that in the end benefits no one, the public least of all.

This does not mean that competition should be done away with, even if that were possible. There is no stronger incentive to effort than competition, actual or potential, and one kind or the other is present in every industry. We of the utilities do not know at what moment our products may be challenged by new discoveries, new inventions, new developments, but we must be prepared to meet the challenge whenever it comes, on

the basis of service and price. If we cannot do so, we must step aside or be pushed aside. We are not passengers in the industrial boat, but working members of the crew. We must "pull our weight" and a little more. We exist to serve the public, and our contribution to the public welfare must be measured by the touchstone service.

Progress

Is the Achievement of Many
Minds and Many Hands
That Is the Glory of Life*

By Dr. Alfred W. Wishart

Pastor Fountain Street Baptist Church
Grand Rapids, Mich.



Dr. Alfred W. Wishart

IN A RECENT magazine article a writer deplored the practice of inviting ministers to address conventions of business men. He thinks the necessity to increase sales demands high-powered salesmen whose chief aid in trade is emotion. Ministers are assumed to be masters in the art of arousing emotions and so can render aid to salesmen. Then, again, religion, prayers, clerical co-operation lend respectability to business ventures and help to establish confidence in the mind of

*Abstract of an address delivered at the annual convention American Electric Railway Association, Cleveland, Ohio, 3 to 7, 1927.

namely public. If that is a true explanation of the presence of ministers on convention platforms, I am out of place here for several reasons.

First, because I believe a religion or a business that exalts emotion above reason invites disaster. Confidence and good will in business must be rooted in something more substantial than sentiment. People may be swept off their feet temporarily by emotional appeals, but unless religion and business can meet the demands of our intellectual and actual needs, the whirlwind will pass away, leaving ruin in its wake. In the long run we have to face facts.

Secondly, I believe that while prayer has its proper place in life, it has its limitations. It requires something more than prayer to please the public, to deal justly with employees and to make business profitable. Piety is no substitute for hard work, efficient management, enterprise and high intelligence.

And lastly, I must frankly express a sorrowful concern for any effort to palm off on the public cheap and shoddy goods, inefficient service of any sort and unsound financial ventures in the name of the Golden Rule or by the aid of advertising sprinkled with pious slogans. The oldest religion in business is downright honesty and square dealing, which means giving a dollar in value or service for every dollar received.

To do this in your business demands a variety of high qualities of intelligence and character. It requires you to keep pace with changing conditions, to meet new needs, to deal efficiently with the many difficult problems that confront modern traction companies. A manager who is too conservative and dull of perception to keep up with invention, new ideas, new methods, is as big a detriment to your business as outworn equipment and machinery. Both belong on the scrap heap.

Obsolete ideas and methods, refusal to change with changing conditions, sticking to old traditions that have lost their meaning and utility are causes of many failures in business and of loss of power and prestige in religion. The disasters that overtook public utilities in the period from which we are beginning to emerge were largely the result of bad policies, corrupt or inefficient methods and stubborn refusal to face the facts of changing social, political and economic conditions. During that unhappy period there were frightful economic losses, embittered relations between the people and public utilities, strikes and corrupt political alliances. The new order of things

which is gaining ground every year is the result of the labors of men of vision, courage, faith and initiative. They are the pioneers of a new era in which the street-car service has been improved and public confidence has been created through judicious appeals to reason. The old methods of protecting public utilities through corrupt political influence are being abandoned. How many are still wandering in the wilderness, unconverted and unconvinced, you know better than I.

Perhaps this is one of the reasons for my being here—to help the progressives convert the unprogressives. Eyes have they, but they will not see; ears have they, but they will not hear. May I humbly suggest that one ground of hope for the unregenerate is that most of the progressives are relatively recent converts? To a great degree the sufferings of public utilities have been brought upon them by those engaged in the business as financiers and executives. Some were the work of demagogues who took advantage of evils that should never have existed. Others were the result of failure to keep up with the march of applied science. And still others were due to a blind refusal to appeal directly, frankly and intelligently to the public.

Patience is indeed a great virtue. Rome was not built in a day. To make matters worse, we no sooner think we have solved our problem than some new idea upsets our theories and requires us to grapple with fresh problems. That is life. This modern world, especially, is no place for skeptics and cowards, the lazy or the stubbornly inefficient. Hence these conventions that inform, inspire, encourage and enlighten! No man, no corporation, no country, is sufficient unto itself alone. We need one another. Progress is the achievement of many minds and many hands. That is the glory of life. Civilization is impossible without co-operation, friendship, patience, courage and mutual confidence. There is no sharp boundary line between religion and business. Your great enterprise, the business of daily transporting millions of people in this broad land of ours, demands moral qualities of a high order as well as engineering skill and executive ability. The reason is that morality is basic to business, for business, after all, is life. Your contacts are not only with machinery but folks. Your problems are not all technical, mechanical, financial. They are problems in human relationships. And I do not see how such problems can be successfully dealt with if we ignore the moral factors of human contacts.

We exist to serve the public, and our contribution to the public welfare must be measured by the touchstone of service.

—GEORGE B. CORTELYOU.

What Makes Good Track?*

By Frank B. Walker

Chief Engineer Eastern Massachusetts Street Railway

WHEN the Eastern Massachusetts Street Railway was reorganized in 1919 several hundred miles of track was in poor physical condition, and it became necessary to carry out an extensive rehabilitation program. New funds were limited, and it was a problem in economics as well as in engineering to carry out the work successfully.

The way and structures department was completely reorganized and decentralized. New track machinery was purchased, an intensive study was made of modern methods in use on other roads and some new ones were devised. A course of training on modern track construction and maintenance methods was given to supervisory and productive forces. Three hundred and ninety miles of track has been completely rehabilitated and welded. Only 10 miles of unpaved and 67 miles of paved track was laid with new rail. Thus it will be seen that 80 per cent of the rehabilitation was carried out by using the old rail. By the use of modern methods of straightening rails, repairing and welding joints, surface welding and grinding, this track has been put in good operating condition at a cost ranging from \$1 to \$2 per lineal foot. The total estimated saving is not less than \$3,000,000.

The condition of the old rail was such that it could not be re-used without the vertical bends being removed and the joints welded. We developed a new bender consisting of a girder beam, on the center of which was a 35-ton jack with heavy yoke passing underneath the rail joint and with adjustable feet for various lengths of bends. On the rehabilitated track 150,000 joints were straightened out with this type of bender at a cost of only a few cents each. In 1921 after about 15,000 joints of various types had been welded, the metallic arc method was adopted and has been standard on this property since. Of the more than 115,000 joints of this type that have been welded, failures have been fewer than with any other method.

It was found that much of the old, lighter rails could be welded by the use of the original angle bars, with



F. B. Walker

the outstanding flange cut off by an acetylene torch. Although this kind of joint had considerably less strength than the rail, many thousands of old plates were used and only a small number failed. This led to the conclusion that the actual strength of the welded joint was of no consequence as much as the quality and kind of welding. This is especially true on 7-in. T-rail and 9-in. girder rail in paved streets. Of our total of more than 130,000 welded joints none has failed in fact. Such few failures that have occurred have been on account of secondary stresses from the welding process or temperature changes, and we believe that properly welded joints will not fail on account of wheel impact. The company has recently developed a new base-plate head-bolt type of rail joint, which is stronger than the fish-plate type and is cheaper. More than 2,000 of these are now in service.

Grinding joints was considered an important part of the program, and 175,000 joints have been ground on a total of about 200,000 in the entire system. Of these 122,500 were surface welded before they were ground. Corrugations in the head of old rail to the extent of about 640,000 lineal feet, were ground out concurrently with the rehabilitation program. The pounding of cars over rail joints and corrugated rail has been practically eliminated, and noise has been reduced to a minimum.

We are trying to bring our property, and have almost succeeded, to the point where there are no bad joints or noisy tracks. We are competing with rubber-tired vehicles, and it is essential that we eliminate track noise and particularly those track noises caused by bad joints, corrugated rails and pounding special work. In this connection it may be of interest to note that we are welding all exterior and interior rail joints of all special work. It is believed that by the elimination of such bolted joints the life of special work will be materially lengthened as the noise from pounding joints is eliminated. So far there has been no trouble due to breakage of such welded special work.

Our present standard paved track is similar to that on many other properties, consisting of either 7-in., 91-lb. T-rail or 9-in. 104-lb. girder rail, metallic arc-welded

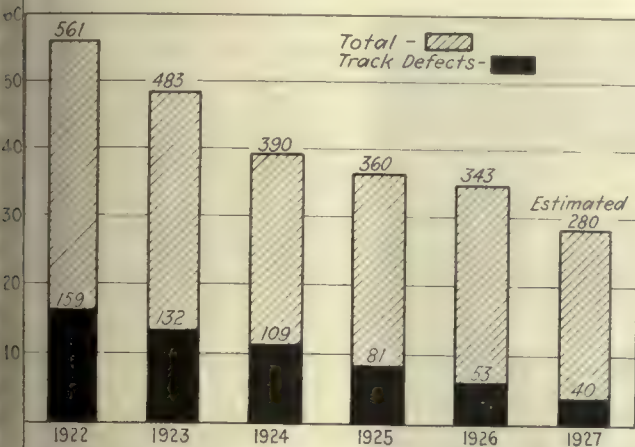
*Abstract of a paper presented at the annual convention of the American Electric Railway Engineering Association, Cleveland, Ohio, Oct. 3 to 7, 1927.

joints, tie rods on 5-ft. centers, tie plates, 6-in. x 8-in. x 8 ft. creosoted hard pine ties and 6 in. of ballast. This costs about \$4.40 to \$5.40 per foot of track, exclusive of paving, depending on type of rail, traffic, etc.

Particular attention has been paid to drainage, as the greatest enemy of good track is water. Most of the old tracks needed more drainage, especially on country lines where there were no side ditches. The tracks formerly were backfilled to the tops of the rails and for long distances the track area was below the highway level. One of our problems was to convince highway and municipal

EASTERN MASSACHUSETTS STREET RAILWAY. ACTUAL COSTS CITY TRACK CONSTRUCTION

Acct. No.		Lowell, Bridge Street 1,380 Ft 7-in T-Rail	Lowell, Lawrence Street 600 Ft. 7-in T-Rail	Lowell, Bridge Street 2,280 Ft 7-in T-Rail
1	Superintendence	\$83	\$35	\$100
2	Ballast	823	364	1,336
3	Ties	905	418	1,496
4	Rails	1,686	722	2,913
5	Rail fastenings	574	247	976
8	Track roadway labor	1,870	1,004	2,965
9	Miscel. track expense.	147	80	435
	Total	\$6,088	\$2,870	\$10,221
	Cost per foot	\$4.41	\$4.78	\$4.48



Dailments have shown a steady decrease on the Eastern Massachusetts Street Railway since the inauguration of the track rehabilitation program

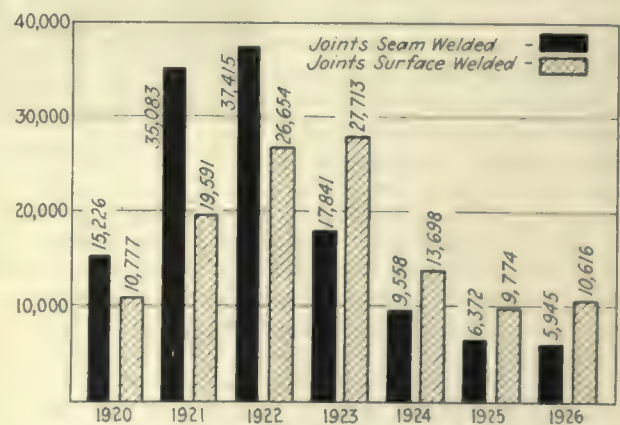
authorities that we should be allowed to raise our tracks level with the shoulders of the adjacent road. An energetic campaign of education was carried on, with the result that we were permitted to raise and ditch about 23 miles of country track. As a result the tracks are now easily maintained, water is carried into the side ditches to culverts, snow is more easily removed, and much better conditions exist than heretofore. In cities the matter of drainage is different, but by placing more catchbasins and seeing that the pavement itself is sealed against the entrance of water along the rails and into the subgrade and ballast the question is largely solved.

The matter of suitable ballast for both paved and unpaved track received considerable thought. The old company had used broken stone ballast on a portion of its paved track and on one or two lines in the country. On unpaved track broken stone is undoubtedly best. It is also the most expensive. On the major portion of our country lines a good quality of bank-run gravel was used. On heavy service country lines stone was used. On paved tracks the practice of using broken stone was abandoned for several years, but on account of its increased cost and the fact that the modern type of pavement almost effectually sealed the track area against the entrance of water, the use of screened gravel was adopted several years ago, and it has been found not only that this is less expensive but that it is as good as if not better than broken stone.

Maintenance costs of paved and unpaved track have been materially reduced in those sections of the track which have been rebuilt or rehabilitated and particularly where the rail joints have been welded. The welded joint track has been successful beyond our expectations. Maintenance expense has been reduced at least \$30 per mile per year. Riding qualities have been

materially improved. Bond renewals, formerly at the rate of about 20,000 to 25,000 per year, have gradually decreased to almost nothing on welded track and only a few hundred per year on the remainder of the system. Return circuit on all lines is in excellent condition, and very rare indeed are complaints made of electrolysis conditions. Derailments due to track defects, bad joints or special work and such other causes have decreased from about 1,000 per year to about 40 per year.

For every \$100 spent on track, \$44 is spent for material and \$56 for labor. The human side of track work is, therefore, of more importance than the material side, if viewed from a dollar standpoint only. An engineer recently asked, "What makes good track?" To this we replied, "The hearts and muscles of the men who do the work." On this property the great need of having work performed properly and by men who knew how to do good work was early recognized. Although the methods employed must be fundamentally sound and the rails, ties, ballast and other materials must be proper for the location, the most important thing is to do the job in a workmanlike manner. We have imbued all of



Yearly record of joints welded on Eastern Massachusetts Street Railway

our men with the idea of not being satisfied with "good enough" and remembering that the best was "none too good."

It is of the utmost importance to have interested men, whether it be supervisory or productive, and it was not difficult to get those men interested. We try to have no old time "bosses" on this job. On the contrary, those of us who are in authority endeavor to be instructors rather than drivers. As a parting thought, I will say that such success as this track department has had on the Eastern Massachusetts property has been because we have considered the human element as of more importance than the material one.

Trends in Motor Coach Engineering*

By H. D. Church

Director of Engineering White Motor Company, Cleveland, Ohio

SEVERITY of the operating requirements of the modern motor coach is rapidly setting up new standards of engineering in motor coach design. Certain engineering practices that are perfectly safe on other types of vehicles have no place in a modern motor coach. The design of any piece of mechanism is determined by operating requirements. A satisfactory motor coach design must be one that either earns or saves money for its operator. The most important developments in the immediate future will probably be in the direction of refining and improving present designs to give greater safety, greater passenger comfort and, last but not least, lower operating costs.

Considering the various chassis units, the engine, clutch and transmission are those in which the greatest improvement is to be expected in the near future. In the broadest sense, the engine design is determined to a large extent by the maximum torque requirements. The engine must have a number of cylinders that gives inherent balance, and the maximum torque requirements will be an important factor in determining how many cylinders are used. With the present-day fuels a distinct limitation on the cylinder bore is imposed by the detonation characteristics of the fuel. A discussion of this phase of engine design would take too much time, but considering the factors involved, it is not likely that cylinders of larger than $4\frac{1}{2}$ -in. diameter will be used, owing to difficulties with detonation and cooling of piston heads. There is something to be said in favor of each of the three types of cylinder construction in use today—namely, the sleeve valve, L-head and overhead valve. Each type is being constantly improved, and actual service alone can give the ultimate answer as to which is the best.

The engine lubricating system is at the root of many troubles today. Full forced feed to all working parts is essential. Provision for properly cleaning the oil is



H. D. Church

desirable, as well as some design of oil cooler to maintain proper viscosity in hot weather. A lubricating detail that should be given more attention in design is the elimination of oil leaks. An engine or chassis unit which is covered with dirt externally as a result of oil leaks is hard to inspect for condition, and difficulties that may have developed are less likely to be discovered. Improvements in engine design as well as in lubricating systems will undoubtedly give much longer life to all the engine bearings.

The importance of rigidity on the life of the working parts cannot be overestimated. A sufficiently stiff crankcase and crankshaft design will go a long way toward the elimination of bearing troubles and the attendant expense. Stiffness of the cylinder block and head is also important. With

the detachable cylinder heads almost universally used, the design should be such that the tightening of cylinder head studs does not distort the valve seats or guides.

Rapid progress is being made in exhaust valve cooling, which will greatly lengthen the periods between valve regrindings. Improvements in the induction system are coming which will give better distribution, higher mean effective pressures for the same detonation and better economy with the present-day low volatility fuels.

All engine accessories, with the possible exception of the fan, should be positively driven through inclosed and automatically lubricated chains or gears. Clutches will probably have lower unit pressures and better provision for heat dissipation in order to prolong the life of the facings. Some provision to insure a really soft and progressive engagement throughout the life of the facing is highly desirable, as it will save wear and tear on the entire driving train between the clutch and the rear wheels. It is probable that pedal pressures will be decreased in order to prevent driver fatigue. Transmission modifications are to be expected in the directions of easier gear shifting and greater silence in the geared speeds.

Chassis frames are being designed to give greater resistance to twisting, which should permit the use of lighter bodies without the sacrifice of body life. In the

*Abstract of a paper presented at the annual convention of the American Electric Railway Engineering Association, Cleveland, Ohio, Oct. 3 to 7, 1927.

connection, I think, there are interesting possibilities in the development of light-weight bodies.

There is a strong trend toward greater accelerative ability to enable the coach to keep its place in modern traffic; by the same token better brakes are needed. I believe that metal-to-metal brakes on all four wheels operated by compressed air or some other form of servo device will soon be considered indispensable. This construction utilizes the entire vehicle weight for braking action, requires little muscular effort of the driver, is excellent from a cooling standpoint, and its action is practically unaffected by oil, water or grease on the braking surfaces.

The use of low-pressure tires should become more general, due to the demand for increased passenger comfort. In addition, there should be a distinct decrease in chassis depreciation when low-pressure tires are used, due to the added cushioning effect, which protects the entire chassis from minor road shocks. The more widespread acceptance of low-pressure tires has probably been somewhat delayed by several causes. In the first place, they have not as yet fully demonstrated their ability to give the same cost per mile as the high-pressure tires. This is because of overloading and constructional difficulties met by the manufacturers. Low-pressure tires have one other less serious drawback, in that they require a greater mechanical advantage in the steering gear.

There will probably be distinct improvements in chassis lubrication. The lubricating requirements of a motor coach chassis are exceptionally severe, due to the high mileage per day. Many of the points requiring lubrication are inaccessibly located, with the result that they are neglected or else the time required to get at them is too great. The solution may be some form of central lubrication or thoroughly housed constructions carrying a sufficient supply of lubricant for long periods.

The question of riding qualities is also due for consideration. The variation in spring load between a part-passenger load and a full-passenger load is great, and means should be provided to insure comfort under either condition.

Two very important items are body heating and ventilation. The exhaust gas-heating system which has been extensively used in the past will probably be replaced by some system using water or air. Some satisfactory provision to give adequate body ventilation without drafts is also most desirable.

Considering for a moment the more radical design possibilities, there are several promising developments in sight. The double rear axle construction, which has been used for the past few years both in this country and abroad, is attractive from the standpoint of good riding qualities, less damage to road surfaces and ability to carry the maximum loads on pneumatic tires within a limited over-all width. However, this construction involves some difficulties in taking care of the torque reactions from the driving and braking loads. From the standpoint of traffic congestion, the present-day motor coach probably has reached the limit on over-all length. It is possible that future developments may result in a complete relocation of the various chassis units in an endeavor to obtain more seating capacity within the present over-all length.

It is difficult to prophesy the future of motor coach design with any degree of accuracy. The rapid increase

in motor coach use has brought about a specialized vehicle in such a short period of time that the engineering fraternity has found it difficult to keep pace with the operating requirements. It is safe to say, however, that the design of the motor coach of the future will be dictated primarily by the demand for safety, comfort and reliability, and it is certain that with close co-operation between the motor coach operators and manufacturers we can look forward to a constant improvement in design, with an attendant reduction in operating costs.

Modern Cars

Effect Economies*

Modernization and Budgetary Control of a System Will Convert a Deficit to a Surplus

By W. R. McRae

Superintendent Rolling Stock and Shops
Toronto Transportation Commission, Toronto, Canada

IT IS indisputable that attractive, comfortable and speedy rolling stock, equipped with safety devices and modern appliances for fast loading and unloading, fare collection, etc., attract the riding public. The car, being modern in itself, is not sufficient from the point of view of maintenance and operation. Modernization must not stop there. To get the best from this equipment, modernization must be carried into the office, shops and car houses in the form of design, equipment organization, system and method. The result of this is lowering maintenance and operating costs and promoting among the personnel a spirit of co-operation, a pride of accomplishment and association, in a modern electric railway system.

On Sept. 1, 1921, modernization of the Toronto Traction System commenced. The Toronto Transportation Commission unified the railway systems, taking over 838 passenger cars previously operated by the Toronto Railway Company and 70 cars operated by the Toronto Civic Railway. Delivery of new rolling stock commenced in October of the same year and continued until the orders for 575 new cars had been completed in August, 1923. These cars included two types of Witt cars and large roomy trail cars. At intervals, 491 of the Toronto Railway cars were scrapped. The remaining 347 cars were of the pay-as-you-enter type, the bodies of which were of such design and in such physical condition as to warrant reasonable expenditure to redesign and convert in a manner that would permit of their being operated under the standard operating conditions adopted on our system, which included a uniform system of front entrance for all types of motor cars.

Modernization did not stop with the redesign of bodies; storage air-brake equipment was scrapped in favor of brakes of the latest design. Obsolete fenders

*Abstract of an address delivered at the annual convention of the American Electric Railway Engineering Association, Cleveland, Ohio, Oct. 3 to 7, 1927

were replaced with life guards. Hand straps were replaced by hand rails. Stoves were replaced by modern heaters. Monitor windows were replaced by modern ventilators. Trolley catchers and tail lights were installed. Manually operated doors were changed to pneumatically operated. On 156 cars spur gears were discarded in favor of helical, and the ratio changed for train and trailer operation.

New shops were designed and constructed, utilizing modern methods in the progress of the work and equipped with modern machinery and appliances. Obsolete car houses were abandoned or rebuilt. Some existing car houses were redesigned and enlarged to correspond in efficiency with the new car houses that were erected.

The I.C.C. uniform system of accounts was adopted, with many subdivisions. The rolling stock department installed a complete cost system in the shops and car houses, together with a system of compiling individual and group cumulative mileage for passenger and service cars, buses and coaches, and a record system for all component parts of equipment that could be identified by numbers. Histories and maintenance costs are kept of the different groups of the modern equipments as well as individual motors, armatures, compressors, etc. Additional new systems were put into force using mileage instead of daily or weekly schedules for inspection, lubrication, etc., and standard practice cards were placed in shops and car houses covering this type of work. Mechanical labor-saving devices, such as adding and calculating machines, filing systems, etc., together with furniture of the most modern type, were installed in a newly erected office building.

Budgetary control was adopted by the commission, and it naturally followed that this system of control was applied in its fullest sense by the rolling stock department.

The Hillcrest shops have a labor budget covering each of the 24 pay periods in the year under ten separate headings of maintenance and expense—i.e., maintenance of equipment, passenger car body maintenance, truck maintenance, brake maintenance, service equipment maintenance, electric motive equipment maintenance, shop machinery maintenance, shop expense, miscellaneous equipment expense and conducting transportation.

Each of the eight shop sections, such as motor shop, truck shop, etc., has a labor budget under headings that apply to the work of each section. This requires 40 budgets, each covering 24 pay periods. Fourteen budgets are required for the seven carhouses. Maintenance of equipment and conducting transportation are the only headings used in each division. Within ten days of the

end of the pay period labor distributions for each shop section and carhouses have been compared with budget, and reports issued to the chief inspector, master mechanic, general foremen and foremen. Amounts are converted into dollars per thousand car-miles and analyzed for excessive expenditures. These results are curved for the purpose of records and comparisons.

The costs of each of the carhouses are based upon the actual mileage of cars operated out of each division. These costs are classified under thirteen headings—i.e., maintenance of equipment, car body maintenance, truck maintenance, brake maintenance, electric motive equipment maintenance, conducting transportation, inspection, car cleaning, car shunting and shifting, car oiling, miles per pull-in, miles per inspection and pull-ins per inspection.

The results are plotted graphically for each carhouse, together with the average costs of the six other carhouses, and blueprinted, a copy of each being sent to the senior foreman for each carhouse. The competitive nature of these graphs creates keen rivalry among the various carhouse staffs and at the same time provides cost data of a valuable nature.

Does this modernization process pay? A comparison of the records shows quite effectively the value of modernization. Over the period of 1923 to July, 1927, inclusive, the reduction in the number of pull-ins for different portions of the equipment was quite substantial, as you will note: Bodies 80 per cent, trucks 64 per cent, brakes 87 per cent and electric equip-

ment 61 per cent. Because of these reductions it is expected that our maintenance of equipment for 1927 will cost \$375,000 less than for 1922. The total reduction for the various classifications over the period from 1922 to June, 1927, inclusive, were found to be: Maintenance of equipment, 33.9 per cent; armature maintenance, 59.1 per cent; controller maintenance, 59.1 per cent; electric motive equipment maintenance, 60.8 per cent; labor charged to equipment maintenance, 53 per cent. The carhouse payroll has been reduced 10 per cent since 1924, in spite of the fact that our cars are cleaner and more attractive than at that time. The advent of new rolling stock considerably reduced the paint shop payroll, but the time arrived when repainting became a necessity to maintain the standard of appearance required.

I think that we are unanimous in the thought that modernization is the keynote of the electric railway of today. The purchase of new rolling stock when possible, modernizing old cars when warranted, budgetary control of all expenditures and standard practice throughout the department will convert a deficit to a surplus.



W. R. McRae

Automatic Substations Prove Economical*

By W. E. Bryan

Superintendent of Power
United Railways of St. Louis



W. E. Bryan

PREVIOUS comparisons of automatic and non-automatic substations have necessitated an estimate of certain operating economies obtainable with automatic stations, since actual data were not available. I shall attempt to give some actual figures covering such economies on the property with which I am connected, the United Railways of St. Louis.

In 1922, due to increases in the number of cars operated over the system as a whole, a number of our manual stations became overloaded, some to a serious degree. Two courses were open: (1) the installation of additional equipment in existing stations where this was possible, and (2) the installation of the additional equipment in automatic stations located in the districts served by the overloaded stations. We decided on automatic stations, so that we now have seven such stations aggregating 8,600 kw. in capacity. These seven stations effected a reduction in the load of nine manual stations, which indicates the widespread effect of the new stations. These stations have now been in operation for about five years.

In the studies of past years it was estimated that the cost of operation and maintenance of an automatic station, say of 1,000-kw. capacity, would be \$750 to \$1,000 per year. On a kilowatt basis the ratio of such costs for automatic stations as compared with manual stations varied, as shown by the 1926 report of the committee on power generation and conversion, from 7.1 per cent to 50 per cent, with an average of 25.4 per cent. These results proved that even during the initial period of automatic substation operation a material saving was realized on this score.

Comparative data for two 1,000-kw. manual stations and two 1,000-kw. automatic stations in St. Louis, taken from the auditor's accounts, show that the operating and maintenance costs of the two manual stations for the five-year period 1925-26 averaged \$3,540, whereas the comparable figure for the automatic stations averaged \$130. Stated in percentage, automatic operation cost 3 per cent of manual operation. The annual difference of \$2,410 in favor of the automatic station on a 15 per cent fixed charge basis would justify an investment of \$36,000 for automatic control equipment for the manual stations. However, certain types of manual equipment, but years ago, are not altogether suited for automatic

operation, and this is true of the two manual stations referred to.

Power economy is, of course, one of the principal advantages of automatic substations. Most railways purchase power on the basis of a demand charge plus an energy charge. In any study of power questions, therefore, both of these elements must be considered. The use of automatic stations in urban districts tends to decrease the demand figure, as the improved voltage possible with automatic stations, as usually located, permits of more coasting for a given schedule speed. High voltage may increase rheostatic losses at the car, but where considerable free running is possible, the net result is improved acceleration and higher speed. In congested areas, where schedule speed is primarily dependent upon traffic congestion rather than on voltage, high voltage increases rheostatic losses without, however, an attendant improvement in schedule speed. It has actually been found in several cases that a marked improvement in trolley voltage in congested areas has resulted in a serious increase in the power demand with no improvement in operating conditions.

Probably the most satisfactory method of avoiding this condition is by the use of the shunt-wound converters. The two St. Louis stations installed in the heart of the congested district use this method, having a drooping characteristic from 600 volts at no load to 560 volts at full load and 540 volts at 150 per cent load. This arrangement has resulted in holding the voltage at the cars in this district at practically the same figure as existed formerly, so that there has been no increase in rheostatic losses or in power demand. There has been, of course, a marked decrease in the I^2R losses in the feeders. Another advantage of the use of the shunt field is that in case of overload the automatic stations "back off" from the load, which is thus shifted to adjoining stations. This arrangement, coupled with the current-limiting re-

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sistances at the stations, permits the moving of an abnormal number of cars at reduced voltage under emergency conditions.

As to distribution losses, a feeder section fed from a station located at one end of the feeder has a certain I^2R loss, but with a second station at the other end of the feeder section the distribution loss would be less. On the other hand, with light loads, the operation of both stations would result in light loads on the converters, with attendant decrease in efficiency. The point at which the second station should be brought on the line can be determined mathematically.

The two St. Louis stations in the congested district are roughly a mile apart, and as they are connected by heavy feeder copper, they might be considered as a single two-unit station with an unusually long bus between units. We have set the relays at these stations so that one unit operates somewhat as does the lead unit in a two-unit station, the second unit coming on when the voltage drops to 520 volts. This arrangement has been altogether satisfactory from an operating standpoint.

Another situation often found on street-railway systems where distribution losses are an exceedingly important factor is a long heavy feeder section fed from a distant station. Under normal conditions the distribution loss on such a section is serious enough, but if a blockade of cars occurs, the trouble becomes cumulative. Cars pile up in the section, further reducing the voltage and extending the time during which power must be fed over the long feeding distance. The feeding of such a section from an additional station or stations reduces the demand figure, saves energy and, what is much more important, materially improves operating conditions. It is difficult to evaluate this third benefit in dollars and cents, but no railway man needs to be told that this advantage very often outweighs, in the eyes of the management, those other advantages which involve a direct saving in energy.

ELECTROLYSIS MITIGATION

All of you are familiar with the effect on electrolysis mitigation of an increase in the number of stations from which the general distribution system is fed. The 1921 report of the American Committee on Electrolysis brings this out very clearly. Our new stations being rather widely scattered, we expected and have actually realized a marked decrease in electrolysis troubles. Our greatest trouble from electrolysis has occurred on underground transmission cables, of which we own and operate 81 miles. Shortly after the first of these cables was installed, back in 1903, we experienced a great deal of trouble due to sheath corrosion where return railway current left the cable sheath. This was easily corrected by installing drain wires so as to keep the cables negative to other earth structures and lead the current safely to the negative bus. This cable was laid in tile or concrete duct.

In 1913, at the time of receipt of Keokuk water power, a large amount of duct of a somewhat porous texture was laid by the local power company, and the new cables laid at that time by the power company and ourselves largely occupied these new ducts. Although the precautions previously in use were taken from the start, serious corrosion of the sheaths developed, this corrosion occurring not in the vicinity of the substations but in those localities where the current flowed to the cables and where the current density on the sheaths was the greatest. This corrosion depended on the amount of

current flowing to and along the cable sheaths, and it became necessary to reduce these currents. In 1917, in one of the districts particularly affected, which was fed by a 4,000-kw. manual substation, we installed an insulated return system, which materially bettered conditions, although damage previously done continued to show up.

The distance between substations feeding the district in question and the overloaded condition of these substations justified the installation of two automatic substations between the old manual stations, which reduced the potential gradients along rail, cable, etc., to a small proportion of their former value. The actual cable burnouts for the five years prior to the installation of the automatic substations were 63 for the system and 28 for the lines in question. For 3.7 years subsequent to the installation of these stations there have been 28 burnouts on the system, of which seven were on the lines mentioned previously. The decrease in underground cable troubles was from 12.6 per year before installing the automatics to 7.6 per year afterward. On the section principally affected the burnouts in the two periods averaged 5.6 and 1.9 per year respectively. The reason why the general decrease is not proportionately as large as the decrease in the section hitherto referred to is because the older cables were laid in non-porous duct and did not suffer to the same extent from sheath corrosion as the newer cables.

The approximate net cost to us per cable burnout is \$500. The average reduction in burnouts, amounting to five per year, is due almost solely to the increase in the number of feeding points and is therefore a credit to automatic substation operation. Thus we have a credit of \$2,500 per year on this score. I might add that the power company has had a comparable decrease in its cable burnouts.

As might be expected, the use of automatic substations brought a decrease in general electrolysis complaints. There was a decrease from a maximum of 51 complaints in 1919 to fifteen in 1927 (to date). For the five years just prior to the use of the automatics complaints averaged 43.8 per year, while since they have averaged 33.2 per year, a decrease of 24 per cent. Based on our average cost per electrolysis claim, this means a saving amounting to some \$750 per year, and as damage claims are not particularly conducive to good feeling, this reduction has a good effect on public relations.

IMPROVEMENT IN OPERATING VOLTAGE

The greater the number of feeding points the higher the average system voltage, and as the new stations are often placed at points of low voltage, the effect on service may be quite appreciable. This effect, because of variation in other conditions, is difficult to evaluate in dollars and cents. Improved voltage on an interurban line not only may reduce the number of cars required to maintain a given schedule but will also, because of increased schedule speed, serve as a means to meet competition of buses and private automobiles. On urban systems, while the effect may not be so marked, any improvement is applied to a greater number of units. Good voltage tends to keep cars on schedule and is particularly valuable in case of blockades. With the present method of feeder control, heavy loads of short duration on individual feeders are carried up to the limit of the safe capacity of the converter, and usually before this point is reached the cars have passed to the territory of an adjoining station.

Cost of Crime

to Electric Railways Each Year Is Enormous*

By W. L. Barnhart

Resident Vice-President National Surety Company,
New York, N. Y.



W. L. Barnhart

PERHAPS no statement that has appeared in public print recently created quite such widespread interest as did the article by Mark O. Prentis which appeared in the *Manufacturers' Record* a few weeks ago, estimating the cost of crime in the United States today between fifteen and sixteen billions of dollars. This figure places crime as one of the leading industries of the United States. The annual loss through crime is shown to be greater than the entire foreign trade of the United States, which amounted to less than ten billion dollars in 1926. In fact, our annual losses through these dangerous and brainy criminals who are preying upon the business public are greater than the aggregate value of all the agricultural products grown in the United States during the past year. Crime necessitates the employment of more than half a million people who do nothing but endeavor to combat the criminals, comprising our police forces, our sheriffs' organizations, our jailers and all the public servants whose occupations are dependent upon crime.

And who pays that gigantic loss? Who is charged with such enormous tribute to the power of the criminal? Why, you and I, and every business man—we all must pay our share. We pay it in taxes to take care of the police and the courts, we pay it in higher burglary insurance rates when criminals become especially rampant in this section or in any other portion of the country. We pay it in higher prices that other business men must charge for their products to repay themselves for their own losses through crimes, and sometimes we pay it through our own lives or the security of those nearest and dearest to us when the modern criminal gets in a corner and, to secure his own liberty, takes without hesitation a human life.

Mr. Prentis estimates the loss due to fraudulent securities at \$500,000,000 per year. I dare say that there has never been a time in history when there were as many counterfeit signatures and raised and altered shares of stock on the market as exist today.

Embezzlement is the second big cause of loss. It is estimated that the amount lost annually from that cause is \$150,000,000. Embezzlements have been on the increase recently not only in number but in total amounts. One of our investigators told me the other day that whereas losses of \$10,000 to \$15,000 were considered large five or six years ago, today embezzlements of \$50,000 and \$150,000 are quite common.

The electric railway field has seemed to prove an un-

usually fertile one for large embezzlement, probably due to the large sums handled by many utility companies, and due, in part, I think, to lax methods of auditing and checking up accounts of trusted employees. Too often the auditors, cashiers and bookkeepers are left with too few outside checks upon their operations.

The recent experience of a certain transportation company is an example of what might befall any company neglecting to audit its books carefully. When the cashier of this particular company disappeared, a complete audit of the books showed a loss of nearly \$70,000. It was learned upon the cashier's arrest that, being successful in covering up a paltry \$350 which was stolen from him, he had carried out the practice to the extent of \$67,000, all for his own use.

Still another case may be cited—this, in way of contrast, being a quickly negotiated fraud. The paymaster of the traction company involved, with a payroll amounting to \$41,000 in his care, slipped away with the entire sum instead of returning to his office, as he had done so faithfully for many years. Craving a part in a speedy gambling affair, he met up with the "type," eager to prey upon his desires. One week was the time required to extract the entire \$41,000 from the paymaster.

What were the mental processes of this man who thus in an instant reversed his record of fifty years of blameless living? Who knows? I confess it's too deep for me. But it may be that for years he had suppressed desires for just this sort of thing, for years he had day dreams and night dreams of being able to do it some day—to sit in and play for big stakes. Perhaps that payroll fascinated him and it may have often figured in his dreams as a way of helping him make a big winning. Maybe these suppressed longings, these inhibited desires just backed up in his brain, like water backs up behind

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a dam in the spring freshet, and suddenly when the pressure gets too great the dam goes out, and all that has been held back all these years goes out with a rush, carrying the traction company's \$41,000 with it.

CAUSES OF CRIME

In investigating hundreds of cases of embezzlement and defalcation, we find the chief causes of crime to be:

1. Speculation and gambling. Probably 60 to 70 per cent of all embezzlers have lost most of their stealings through gambling—on the stock market, through bucket shops or by playing the races. The gold digger type of woman has seemed to become more numerous and more insistent in her demands for jewels, fur coats and all the things that take money to buy. And seldom does she seem to care how her victim gets the money to satisfy her whim, just so she gets it.

2. High cost of fast living and fast women. High life as practiced these days in the large cities is an expensive process. Expensive liquor, high night club charges, speculators' prices on seats for popular shows and so forth, have been a factor in many a defalcation.

3. Liquor and drugs. Those who investigate our claims tell me that there is no question that high cost and poor quality of liquor and the growth of the drug habit have had a great deal to do with increases in crime today.

4. "Keeping up with the Joneses." Extravagant living is unquestionably responsible for a great deal of embezzlement and crime today. Installment sales and long retail credits have made it easy for the average American family to live beyond its income, and the spirit of "keeping up with the Joneses" is in the air. Things go along so far, then bills accumulate and creditors get ugly, and the temptation to steal from the employer may be very strong.

5. Finally, the factor responsible for the least of all our embezzlement crime is actual family needs. Sickness or death or trouble of children or parents may put an unusual burden on an employee and he may steal because that seems to him to be the only way out.

Such are the five chief reasons upon the employee's part. But there are yet three causes of crime for which you must accept actual responsibility and I am not sure that, after all, they are more vital causes of embezzlement losses than anything the employee may be responsible for.

THE RAILWAY COMPANY'S RESPONSIBILITIES

Here are your responsibilities for the growth of crime:

1. The employee steals from you because he is able to find a way of doing so without fear of being detected. In other words, your employee, an expert in figures, finds a vulnerable spot in your armor. If he couldn't find a way to steal without fear of prompt detection, he would not become an embezzler.

I should be foolish to attempt to tell you folks, who are professional auditors, how to establish checks and counter-checks on your accounts. Let it suffice to say that every case of loss reveals that somewhere a treasurer or auditor has fallen down in his duty of knowing what is going on. Some loophole has been left unguarded and through it your bank account has been attacked.

Have frequent outside audits made. Get the best talent you can and pay for the best and most complete check-up. It may save you many thousands in losses. Devote some of your thought and energy to finding out yourself what's going on. Go over the books occasionally and draw off some figures for comparison. Any auditor

or treasurer worthy of the name should have some sort of personal checking figures that would tell him very quickly that something was wrong when several thousand dollars had been extracted from the bank balance in a week.

Another duty no treasurer should ever intrust to a subordinate is that of going to the bank to get the canceled vouchers and then checking them up with the check book stubs. We know of many cases where employees raised or forged checks, got the money, and then went to the bank for canceled vouchers and destroyed the evidences of their guilt before they got back to the office.

2. The second way in which you employers encourage crime is by not knowing enough about the home life of your employees. If more employers had an idea of what their employees were doing after hours, hundreds of embezzlements would be nipped in the bud. In fact I suppose quite as many defalcations are discovered through the employer accidentally finding out his employee's scale of living or his night dissipations as from any other cause.

We recommend that every employer of labor should have one or more "assistant managers" whose chief duty it would be to mingle with the employees, especially those handling money, and find out as much as possible about them. He should be a man of tact so that employees would never suspect his duties, and he should also have some actual work to do about the place, but his chief function should be to mingle with the men, to go around with them at nights, to learn anything that might be of interest to his employer.

3. Third and last, don't put too much trust in anybody. It sounds wonderfully noble and altruistic to trust everybody, to proceed on the basis that all men are honest. But to believe in everyone has proved costly to many.

Remember this: Only the trusted men can steal. It was that very trust placed in him which gave him the opportunity to steal. And who shall say that it was doing him a kind act to trust him so implicitly? That very trust made him a criminal, an outlaw, despised in the eyes of the world, a betrayer of the faith of his family and his employer, the wrecker of the hopes of his wife and children.

No, my dear men, you are really handing your employees a curse instead of a blessing when you trust them too far. If you won't do so for your own sake, if you won't do it for the safety and security of your own money, you owe it to your employees to insist that they have the added protection, the added stiffening of their moral backbones, that comes through the knowledge that they are bonded by a large surety company that will relentlessly pursue and prosecute them if they do wrong. And if you should decide upon this course, be sure to secure adequate protection. Little \$5,000 and \$10,000 bonds are hardly a drop in the bucket as compared with the \$50,000, the \$100,000 and the \$150,000 fidelity losses that are so common today.

Wouldn't it have been infinitely better from the standpoint of the employee, from the standpoint of society as a whole and from the standpoint of his employer's bank account to put a strong restraining influence upon the employee, such a restraining influence, for example, as comes from the knowledge upon the part of the employee that he is under heavy bond, that his every act will be checked up by competent auditors and that if he does steal the long arm of organized surety prosecution will follow him, and will bring him to justice sooner or later, no matter how far away he goes or how long he seems to escape immunity from punishment?

Maintenance of a Large Overhead System*

By M. W. Cooke

Superintendent of Power and Inclines Pittsburgh Railways, Pittsburgh, Pa.

Mass production methods can be applied to the construction as well as to the repair of overhead lines



M. W. Cooke

A large railway system covers so much territory that the natural tendency has been to break the line maintenance crew up into small units and place the units at different parts of the system, in much the same way that the cars are housed at different parts of the system. This is the so-called district or division form of organization. The number of men is small and the variety of the jobs large, so that there is little opportunity to put the work on a functional basis and secure the benefits of specialization.

If it were possible to pick the entire railway system up and put it on a conveyor, it would also be possible to have repairs made as the several parts passed the men whose specialty it was to repair each of them. The problem of having an adequate supply of machinery and tools would be greatly

reduced, because it would be necessary to have them at only the one place. The problem of supplying material with which to make repairs would be reduced for the same reason. Supervision would be made so simple that instead of the supervisor spending his time and energy locating the men out on the system he could spend them studying and organizing the work so as to secure ever-increasing efficiency.

It is, of course, not possible to put the railway on a conveyor, but it is possible to run the equivalent of a conveyor past the railway. By consolidating men, machinery, material and supervision and moving the combination over the system as a unit it is obvious that repairs can be made more efficiently than by having the component parts of the consolidation working at widely separated places. After the method has been in effect long enough, it is reasonable to expect either a higher standard of maintenance for the same cost, or the same

DISCUSSION of any broad maintenance problem is naturally divided into two parts. First, all most important, are the principles involved and their method of application. Second are the practices that develop as the result of the application of the principles.

Generally speaking, maintenance work is a tinkering sort of operation, with different pieces of equipment, more or less widely apart in location, requiring repairs at the same time and with no apparent connection between the causes or the times of failure. The problem is further complicated by the wide variety of things a maintenance mechanic is expected to be able to do.

It is small wonder, therefore, that construction work is much more efficiently organized and handled than maintenance work. The desire to build things or to be mixed up in construction is common to all of us. Even as children we got pleasure out of building things, but few of us took care of our blocks when the game of building was over.

The development of the building or production instinct has resulted also in the development of a production technique. Relatively small numbers of men now produce vast quantities of material as the result of that technique. The technique is the combination of such principles as standardization, specialization, functional organization, and so forth, and the final result is mass production.

In this sketchily drawn contrast between the tinkering methods of maintenance and the production methods of construction really exists, it is obvious that maintenance work can be vastly improved and simplified.

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standard at a lower cost, or both higher maintenance standards and reduced costs. Human nature being what it is, a reduction in costs and a better standard of maintenance will both be secured. The psychological basis for that statement is well known.

The adoption of this method will involve some difficulty, and it is to be expected that troubles will develop which will result in pressure tending to break it down, especially during the transition period. Undoubtedly more failures will occur while the tinkering process is being tapered off and the mass method is not fully in effect. However, unless both methods can be afforded simultaneously, there will be nothing to do but grin and wait for better results to follow.

The organization of the line department to secure the best results by using mass production methods will vary somewhat with local conditions. It is essential that it be organized on a functional basis, so as to secure the benefit of specialization. The work can be divided on the basis of routine and emergency, or usual and unusual, or, in more familiar language, repair and construction. These jobs that have to be done over and over again, are to be assigned to the group doing the routine, usual or repair type. The other jobs are to be assigned to the group doing the emergency, unusual or construction type of work. To illustrate, the changing of ears or of span wires is a routine job, while the stringing of long renewal sections of trolley wire is a construction job. Another way of looking at this division of work is to consider it from the standpoint of size. A small job will fall in the repair classification, a big job in the construction classification; the whole point being that the work assigned to the floating mass production crew is such as not to delay it unduly, and thus interfere with its prime advantage, which is its rapid rate of movement over the property.

The rate at which the crew moves will depend on the amount of work which has to be done. This rate can be varied to suit the requirements of the job by varying the size of the crew and the amount of equipment assigned. It is to be expected that it will take longer to go around the first time or two than it will on later trips, because the first few trips will plow into the system a backlog of material the renewal rate of which is low.

Careful judgment will have to be exercised on the initial overhaul trips not to renew material which might reasonably last until the next time around. If there is any doubt about a given piece of material, it should be exchanged as a matter of course.

Since the schedule is set up on the basis of the length of time the most rapidly wearing part will last, it is obvious that a fine sense of judgment will have to be exercised with reference to the parts that wear longer. Some will last two or three times as long and in the interest of economy should not be renewed. In order to preserve the efficiency value of the grouping of men and machinery, the work to be done should be laid out for the crews, so that no time will be lost inspecting and debating about the renewal of a given piece of material. This laying out can be done by having the line inspected in advance of the arrival of the crew, and the parts for renewal marked, or a list made of their kind and location. Such a list from a competent inspector will enable the supervisor in charge of the crew to assign the work in advance to each unit, and the whole job can then proceed without delay.

The schedules being set up on the basis of the life of the most rapidly wearing part, that part now assumes a

value not before recognized. Obviously, if by substituting another type in its place, or by redesign, the life can be increased, the overhaul period can be lengthened and further economy achieved.

It is to be expected that as a further result of this method the ratio of labor to material in the cost of line maintenance will change—that is, it will be necessary to spend less money for labor—although in fairness the rate of compensation per man should be increased, while the amount of money spent for material should decrease. Generally speaking, the cost of labor in line maintenance work is greater than the cost of material. If the method advocated here were successful, the spread between these two items should narrow and probably closely approach.

Just where the two should stand with reference to each other is probably impossible to determine accurately and will vary with the cost of both labor and material, but it is certain that as the spread between the two is narrowed the condition of the plant should improve.

Lack of time prevents the carrying of the discussion over into the construction phase of the maintenance problem, but it would appear that by suitable modification the same mass production method might be applied.

Development of methods of this kind not only should prove economical to the railways company but should at the same time improve the quality of the service to the public and the condition of the men who do the work.

Handling Passenger Revenue*

By Horace L. Howell

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RELATIVE merits and the possible economies that may be effected in the accounting and auditing of passenger revenue, based upon the use of metal fare tokens, versus the use of paper tickets, in transacting fare payments, are of interest.

The first economic value gained with the use of metal tokens, as compared with the use of paper tickets, is in the initial or investment cost. The initial cost of the tokens is chargeable to capital account, since tokens are indestructible and therefore are a part of the company's physical inventory. On the other hand, the cost of paper tickets is an operating charge, the paper ticket being used but once to transact the single fare payment.

On most properties it is found that the single token is put into circulation about 50 times, or once each week, during the year; this means that the cost of the average paper ticket will be materially greater than the initial cost of the metal token over a given period.

The amount of the second economic phase resulting from the use of metal tokens depends primarily on the physical arrangements of the property—that is, the system of fare collection employed; the rates of fare; the provisions at receiver's or main office, and the size of the company.

The important and vital work of checking through the earnings can be accomplished more economically, faster

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H. L. Howell

with a greater degree of positiveness through the use of "all metal" fares and mechanical auditing methods than with paper tickets, regardless of what provisions are made to separate and count the latter.

The labor cost incident to manual sorting, auditing and destruction of paper tickets is considerable. The process is slow and involves added handling and detail, whereas the metal tokens can be sorted and counted with approved accounting machines more rapidly and with less handling, thereby effecting a saving in the labor payroll.

The question frequently arises as to whether or not it is necessary to obtain a new supply of metal tokens with the inauguration of a change in the commutation fare rate. This is a matter of importance and is worthy of comment. When a change in fare becomes effective, there will naturally be a quantity of tokens in the possession of the riding public, representing tokens previously sold but not as yet collected in fare payments. The condition will prevail whether the change in fare rate is increased or decreased. At no time, however, will the actual turn-in of these unredeemed or unused tokens ever approximate their full 100 per cent book value, since there will be a considerable number of these outstanding tokens either lost or carried away. In the event of a reduction in the commutation rate of fare, the probable gain from this transaction would offset the probable loss

that might occur with the inauguration of an increased fare rate.

In connection with the operation of any property having a commutation or reduced fare rate, there will undoubtedly be a collection of a number of foreign tokens. The amount of volume of such collection of foreign tokens will vary somewhat in proportion to the size of the operation, the number of reduced fares in daily circulation and the proximity of the railway system to other reduced fare operations.

I am advised that our association now has this matter in hand and is concerned as to what should be done to best take care of exchange settlements for foreign tokens between member companies.

The writer avails himself of this opportunity to state that he is an ardent advocate of the establishment of but two adult rates of fare—that is, a cash and a commutation rate of fare. The differential between the cash rate of fare and the commutation or token fare should be as wide as possible, since it would then tend to re-establish the single coin unit form of fare payment and facilitate platform transactions and permit of economies in the accounting and auditing of the passenger revenue. This system of fares would also expedite passenger platform movements and would in turn be reflected in the car schedules.

In conclusion, it may prove of interest to note briefly the relative advantages and disadvantages of the use of both paper tickets and metal tokens as follows:

PAPER TICKET FARE

Advantages—Good for handling in large quantity sale lots. Useful for clearly stating fare rates and privileges. Good for hand collection, since canceling with punch is obvious by inspection.

Disadvantages—Can be counterfeited without great effort or expense. When sold in strips, can be torn short and thereby obtain more tickets than to which entitled. Can be split, thus making two tickets from one. Not conducive to good accounting—thus affording opportunity to speculate, holdout and resale. The printing charge is a recurring operating expense. Requires considerable labor for sorting, counting, destroying, etc. Makes for slow auditing. Less sanitary.

METAL TOKEN FARE

Advantages—One investment in tokens will suffice for years, since they are indestructible. They lend themselves to mechanical accounting because of uniformity of size and shape. Difficult to reproduce. Metal basis gives them a greater intrinsic value. Speedy for transacting fares on platform with changers. All fares are metal. Makes for quicker and better mechanical auditing, thus reducing labor cost.

Disadvantages—Bulky in weight for large quantity sales. Limited at present to but four distinctive size diameters, other than those of standard coins.

The noblest religion in business is downright honesty and square dealing, which means giving a dollar in value or service for every dollar received.

—DR. ALFRED W. WISHART.

"The Claimant's Doctor"*

How May He Be Convinced of the Company's Fairness and His Friendly Co-operation Enlisted?

By Hart E. Fisher, M.D.

Chief Surgeon Chicago Rapid Transit Company,
Chicago, North Shore & Milwaukee Railroad and Other Companies

THIS subject is primarily one of public relations between a transportation company and its customers, the traveling public. The successful claims man and his assistants can make more true and loyal friends for his company by cordial business intercourse with claimants, than can any other official or department. High-handed, high-pressure, critical and gruff tactics can make more and lasting enemies than all other employees combined can counteract.

When a person is injured, be it trivial or serious, he may be so mentally disturbed that he will do and say things that he never would have done or said in calmer moments. Many people are ignorant of the methods of big business and its routines, and when under stress of an accident they are afraid if they say anything regarding their injuries that their words will be misconstrued and used against them in suit. The past performances of unscrupulous employees in claims work in making small settlements of cases, the rough treatment that many claimants experienced at the time of making settlements, the suspicion evidenced on the part of the claims men that claimants are malingering, have all been magnified by the average claimant, with the result that the old, obsolete claims methods are the ones that he has in mind when he is injured. It is up to each one of you as executives in our industry to eliminate from your personnel those employees who do not have the milk of human kindness and the business finesse essential to successful claims men. A settlement, made with a claimant who goes away dissatisfied and settles his claim in a frame of mind that it is the best he can do under the circumstances, is a costly investment, many times over what a satisfactory settlement of a few more dollars would cost,



Dr. Hart E. Fisher

besides losing a friend to the company in future contact.

It may be asked, what has this got to do with the confidence and co-operation of the claimant's doctor? The answer is—if we secure the confidence of claimants in our honesty, fairness and good intentions, this mutual understanding will very quickly be inculcated in the claimant's doctor and he, in turn, will have confidence in the fairness of the claims men and the company we represent. You cannot convince a claimant's doctor of our honest intentions if his patient tells him of unpleasant contact with other employees of the company. This confidence grows with the speed with which medical aid is secured, the dispatch with which the patient is removed to his home or hospital, the attitude on the

part of the medical man summoned by the company, the thoroughness with which an examination and treatment is instituted and the speed with which the claims men get on the job to be solicitous as to the comfort and needs of the patient. There is plenty of time for a settlement later, if we gain the claimant's confidence in the haste and excitement of the accident, or soon afterward. The time to prepare the patient for settlement is when he is comfortable and calm.

The claimant's doctor now enters the scene, either at the request of the claimant or the company itself. If you secure the name of the claimant's doctor at the time of injury and then invite him on the case at once, you will show by this action that you have nothing to cover up and that you value his aid. In most cases this places the claimant in a more receptive and confident mood as to your real intentions. If it is a liability case, it is better to have your own surgeon working in harmonious unison with the claimant's doctor. Do not quibble about the doctor's expenses and the hospital bills, but give free rein just as you yourself would expect to be treated and care for if some other company was liable for your behalf.

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injured. Keep claim adjusters away from the patient until he is discharged, cured or healed as far as medical and surgical science can do. If the patient is turned over to his family physician, keep your interest up in the case, but do not belittle the doctor by sending so-called experts or examiners out to check up on him, under the guise of securing an examination. Untactful, pompous doctors, feeling their importance, having an attitude of suspicion as to the patient's real injuries, who are sent by the company to consult with the claimant's doctor, have done more to cause a feeling of distrust and resentment on the part of the doctor than anything I can think of. Treat the physician on the case in an ethical manner, value his opinions and you will get his co-operation. Do not permit claim adjusters to call up the claimant's doctor promiscuously, making suggestions, asking for information as to treatment, or asking him when the claimant is ready to settle. This may seem a trivial matter to you, but is resented by the attending physician as a transgression on his professional rights.

SEE THAT THE PHYSICIAN IS PAID

When the company calls a physician to an accident or sends the case to a hospital it should guarantee the doctor that the hospital that all bills will be paid up to the time they are notified to the contrary. Failure to pay initial expenses after it is found that there is no liability makes a doctor belligerent, and hard feelings arise that bode no good for the company in future contact and co-operation will be found lacking. You hate to lose a dollar, so why should you expect the doctor or hospital to hold the bag and lose by your transaction when, by nature of their profession, a great deal of their work is done without compensation. Furthermore, each hospital has on its staff doctors who are located in the vicinity, and they act as a large family. When the hospital or one of the staff has difficulty with a claims man or a surgeon sent by the company, it will be spread over the entire hospital. One doctor's grievance becomes the grievance of the others, until sentiment in that hospital is antagonistic toward the company and your cases are not wanted. Your next claimant's doctor may be on the staff of some hospital that has had unpleasant relations with your company, and you will suffer in securing his co-operation. If the doctor is antagonistic you can be sure that the patient he is treating will look upon your efforts with suspicion.

Many times a claimant is not honest with his or her doctor, and after a settlement is made for a stated sum plus the doctor's bill, the claimant does not pay the doctor. You say that is no concern of yours as you have paid the full sum to the claimant. That doctor's advice and treatment have made it possible for you to make a settlement economically, and you want to hold his good will against the day when he might again be a claimant's doctor. How easy it is to ascertain if the physician has been paid when you settle with the claimant. Get in touch with him so that he knows you are at least trying to safeguard his interests. He will appreciate your efforts and be glad to assist you in the future. Another good practice is to assure the claimant's doctor that you will take care of his bill when the case is settled, so he will not have worked in vain, should the claimant fail to pay him for his services.

Have purposely refrained from mentioning claimants and doctors who are not honest with the company or have what is known as "blind" cases, but you can

secure even their co-operation if your attitude is right. No matter how guilty a man may be, he does not relish being considered a crook or a fraud. If he can be made to look at your side of the case and if you have the services of competent surgeons, he will, of necessity, modify if not retract his claims as to injury. The fault most common in handling these cases is to permit this class of doctor to see that you believe they are frauds. They assume the rôle of a discredited doctor and so confide this to their clients.

When a claimant's doctor sends his bill to you for services that have been rendered a claimant, do not take the attitude that his charges are exorbitant. This puts the doctor in the light of having wilfully padded his bill. If he reduces the bill in order to secure the money without suit, he will remember this the next time he has contact with one of your company's claimants.

When a claimant makes a settlement under stress, which is unsatisfactory to him, be careful, as he may be the relative of some physician and in the future you may have the unpleasant sensation of having this doctor attend a claimant. Most likely, he will recall the poor settlement or inadequate services rendered by your personnel and advise his patient of the fact, thereby creating antagonism in an otherwise fair and honest claimant.

Spread your medical and surgical cases among the general medical profession in your locality and do not depend upon the services of a chosen few who are given the bulk of the work out of friendship, or because they make calls at a low figure. This makes the future claimant's doctor feel that he is slighted. Make as many friends as you can in the entire medical profession. It is better to have too many doctors making calls for you than to have one doctor disgruntled because favoritism is shown to a few of the elect.

Very often, in all sincerity a doctor advises a claimant to settle with the company as he believes the patient has recovered or that there is no possibility of any future disability resulting from the injury. The claimant settles in good faith. In a short time some unforeseen condition arises resulting from the injury, and the patient is forced to undergo further medical attention and asks for further aid. If you call in his doctor, offering assistance toward putting the patient in good health, you make lasting friends of both the claimant and his medical advisor, and the return in friendly public relations for your company is tenfold over the additional money spent by you after the case was settled.

TREAT THE CLAIMANT'S DOCTOR WITH CONSIDERATION IN COURT EXAMINATION

Testifying in court is an event that no physician relishes and he consents to appear as a witness only on account of his obligation as the claimant's doctor. This is where many an otherwise friendly and open-minded physician becomes antagonistic and resentful against your company, which in turn means your claim department, by the fact that you permit a so-called expert medical witness to place the claimant's doctor in the position of telling an untruth, and the trial attorney attempts to make a monkey out of him before a jury, by his confusion. Remember, the jurymen are each forming an opinion, and it is human nature to be on the side of the under dog. Sympathy for an honest but confused doctor on the stand at the mercy of superior cleverness and legal intelligence has been the deciding factor in a verdict for the plaintiff, and at the same time a life-

long enemy is made for your company. A little more tolerance and consideration should be shown the claimant's doctor on the witness stand.

I believe all men have open minds, and will co-operate when they know all parties concerned are acting in a fair and honest manner; but allow discord to creep into this harmonious circle by some suspicious or untactful error, and then there is cause for lack of confidence and co-operation. I believe that the friendly public relations existing today will make the settlement of claims easier in the future, and claims men will experience the satisfaction of knowing that each settlement has been the means of making many new friends for their company.

Co-operation Among Public Utilities in Local Territory*

By C. B. Hardin

General Claim Agent
United Railways of St. Louis

NEVER has there been a time within my experience when the active co-operation of men in our line of business was so imperative. The alignment of the crooked doctor with the crooked lawyer has stimulated the presentation of exaggerated and fraudulent claims against public service companies, automobile owners and industrial plants, sometimes of claims against several different companies by the same parties. The passage of a workmen's compensation law in our state lately has increased the activity of the ambulance chaser in the solicitation of public liability cases. The growing indifference to perjury by those in charge of our law-enforcing agencies is quite noticeable, and the increasing political power exerted by the ambulance chaser and his henchmen has given more power to him in the courts and over judges.

There are other important reasons for our co-operation. The claimant of no unusual prominence collects from some local company for a bona fide injury. Later he has another accident in which my company alone is involved. He does not publish to the world his former claim experience nor the injuries sustained therein, and I may pay him again for some former injuries certified to by his physician working hand and glove with his attorney. I am next confronted with a "No Report" claim. No amount of investigation has developed any information from our employees. If I could go to a properly functioning central bureau, I might find that he has had a previous claim against some insurance companies' assured, or against the city on account of some sidewalk case, or against some other public service company—all "No Reports." If so, I should be in a much stronger position either to decline the claim or to make a cheap settlement.

Then a central bureau is a splendid check on your own business. Handling 10,000 new claims a year does not permit you or the members of your staff to remember the repeaters nor the experience you have had with persons in the same block or immediate neighborhood. A proper filing of your record cards both as to name and address gives you this information at a glance. We know we often have to combat the bad influence of an improvident settlement in a neighborhood, yet if fully informed, we may sometimes be in a position to invoke the aid of a satisfactory settlement or the satisfactory ending of some litigation, to our advantage.

So far we have been unable to get the co-operation of some of the other public utility companies in reporting their personal injury claimants, and none of the insurance company adjusters seems to be interested. I could cite from my files a number of instances where money could have been saved for my company had the records of the claimants with other local companies been available. You may say, "Well, why didn't you dig up such records?" In reply, I say, "Unless such records are voluntarily sent to a central bureau, you cannot cover by one-half the local field. You cannot obtain authority to employ sufficient help to do this and it would be impracticable to have personal calls made on each other company on every personal injury claim."

MEANS OF GETTING CO-OPERATION

In what way can co-operation be best accomplished?

First, by the organization of a central index bureau to which all the liability insurance companies and public service companies in the local territory report the name and address of every personal injury claimant. Such a bureau could be operated for \$200 per month. In a small city the expense would be lower. It should be consulted by the various companies on every personal injury claim. My company has maintained such an index for many years at its own expense, furnishing free information to anyone who will promise to report personal injury claimants. We put everything in it: personal injury claimants, divorces, newspaper clippings, damage suits against others as well as our own, unusual happenings, adverse witnesses, including doctors, jurors who serve on our cases, property claims declined, inquiries from other cities and records of any crooks.

Second, by frequent informal meetings of the local adjusters of insurance companies, the chief representatives of the claims departments of the public service companies and anyone else who might be interested in our work. The acquaintances made and friendships formed through the meetings are most valuable.

Why do we have to work so hard to get this co-operation? In the first place, the insurance companies have not the same incentive to keep the cost of their settlements down, for if their claim experience with an insured is bad, up goes his rate. Adjusters of many insurance companies are permitted to take outside business, so do not hesitate to represent any of their assured and their guests or their employees against other insurance companies or public service companies. Then the adjusters of some of the small public service companies have only a few claims to look after and are not impressed with the seriousness of the situation that now confronts us. For the last two years I have paid out for my company nearly 7 per cent of its gross earnings in the investigation, adjustment and defense of claims of every character, and this year it will not be much better. Some measure of relief will have to be found.

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The Company Doctor and the Professional Medical Witness*

By John A. Leeming, M.D.

Medical Counsel Chicago Surface Lines

IN DISCUSSING "The Company Doctor and Litigation," I shall make some reference also to "The Claimant's Doctor." Consider briefly an injury which may develop into a case of neurosis: A woman is hurt in a street-car accident. No bones are broken, but she is bruised, scared and shaken up. She calls her family doctor. Suppose he makes little of the injury and its effects; he uses appropriate measures to relieve the pain and soothe the bruises. He discourages any suggestion of a claim for damages, encouraging his patient to believe that the company will treat her with perfect fairness. It is safe to say that under these circumstances the outcome of the case would be just the same as if the injury had occurred by the patient falling on her own kitchen floor, which means in all probability that in two to four weeks the whole incident would be a thing of the past.

But suppose the family doctor is hostile to the company's interests, even at the expense of his patient's speedy recovery. Such a medical man usually has but little difficulty in bringing about in his patient's mind a condition of introspection which leads her to dwell upon and magnify her symptoms. He makes it known that he has had cases of this kind which were followed by serious and permanent after-effects. He drops the remark that, as he understands it, the company is absolutely liable, and he sees no reason why it should not be made to pay for its carelessness. In such an atmosphere this type of claimant's doctor has much to do with the progress and outcome of the case.

The company doctor must also be considered, but his connection with the case will be considered later.

Then we have "The Professional Medical Witness." I wonder whether we all have the same understanding of what is meant by a professional medical witness. A marked distinction should be made between a professional witness and an expert witness, not only in the medical but in any other learned profession.

The true professional medical witness as a medical man who is ready to sell his evidence for money. To be a success in this line he must necessarily adapt his goods to the purchaser. In other words, he must please his customer if he is looking for more business from the same source. Let us look into this matter and see how it works. I have medical men in mind who correspond to each one of my fingertips. If necessary, I could name them and describe fairly accurately their individual methods, but they are practically alike in all essential particulars. They all "stand in" with one or more plaintiff's personal injury lawyers.

A close relation exists between such lawyers and medical men. They refer cases to each other, and it is well understood between them that while the doctor does no business on a contingent basis and he must be prepared so to swear on the witness-stand, yet he never thinks of sending a bill for services unless a verdict is returned against the defendant. The usual setting is something like this: Take the case described above. The case gets into the hands of a lawyer. He listens to her story and makes arrangements for her to present herself to the doctor who is later to appear in her behalf as a professional medical witness.

The doctor proceeds to examine her, and listens patiently and encouragingly to the list of subjective symptoms, even though he knows full well he will not be permitted to testify to them in court but will be, or should be, limited strictly to objective findings. Why does he favor the relating of all the subjective stuff? He will not say, though he has his reasons. A certain plaintiff on cross-examination, when asked if she had told the whole story of her sufferings to the doctor who had examined her a few days before trial at the request of her lawyer, replied, "Yes, the doctor said I should go over the story as often as possible so that I would have it down 'pat' for the witness stand." But there are other reasons. The professional medical witness writes a report to the lawyer, but before doing so he tells him over the phone that he finds very little objectively—increased reflexes and an appearance of nervousness—but he says she tells a fine story of her pain and suffering, and if this story can be presented to him in the form of a hypothetical question embodying also his few objective findings, he would be able to answer the question and express the opinion that the hypothetical individual was suffering from traumatic neurasthenia.

CROSS-EXAMINATION OF THE RIGHT KIND

How are you going to nullify the effects of such evidence? There may be various ways, but the first step in this direction is by the right kind of cross-examination. I advocate showing the close relationship between the witness and the plaintiff's counsel; that the case was sent to him by the lawyer for the express purpose of preparing himself to take the witness stand and testify in her behalf; that he has done the same thing in other cases for the same attorney. I recommend next that he be examined closely on the hypothetical question, making him admit that in his replies he did not take anything into consideration which was not contained in the question, that in answering it he was not influenced in any way by what the plaintiff told him and that his responses referred to the hypothetical person only and

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not to the plaintiff, that he assumed to be true everything stated in the hypothesis, that if the assumed facts were not correctly stated in any essential particular it might change his answer, that he assumed as stated in the question that until the time of the accident the hypothetical individual was a perfectly healthy woman.

In reference to his examination, I would ask him if he had sent a written report of his examination to the lawyer, whether he has a copy of it with him and, if so, would he object to producing it. When this is evaded or declined, I like to hear defendant's attorney inquire whether the witness has described everything he did in his examination, if he has told everything he found objectively, whether he learned while taking the history that the plaintiff was well until this accident occurred, and then follow this line of cross-examination by directing attention to the objective evidences described. In the sample case under consideration these evidences were an increase in the reflexes and an appearance of nervousness. There may be given other alleged objective signs such as limping, muscular rigidity, rapid pulse and heart action, etc.

It is a difficult and somewhat risky task properly and safely to question a real professional on these symptoms. Let me suggest a rule which I have presented to my class in law school for many years: Never question an adverse witness unless you are satisfied that his answer cannot hurt you but may help you. Some of you will say, "That is an easy rule to state, but a difficult one to put into practice." I am willing to agree with this, but if men engaged in this line of work should fall down because of this or other difficulties daily encountered, they would be prostrate most of their time.

Let me suggest the following line of questions and invite your criticism as to whether they would be safe or whether the answers thereto could hurt your case.

Doctor, what is an objective symptom?

Do you agree with this definition, an objective symptom is one which the examining doctor can discover without the aid of the patient and which cannot be simulated by the patient?

Do you think "an appearance of nervousness" is purely objective?

Have you not seen "an appearance of nervousness" with somewhat increased reflexes in women who have never been injured?

In such cases will you name some of the various causes which might produce it—not too many, on account of the time required—but give the jury about a dozen of the most common ones.

In answering the hypothetical question, did you exclude all such possible causes?

In making your examination of the plaintiff did you make a careful investigation that enables you to exclude all such causes in her case?

Did you examine the pelvic organs, the rectum, the urine, the blood or take the blood pressure?

Do you know whether this woman has any local foci of infection in her teeth cavities, tonsils, accessory sinuses of the upper air passages, appendix, fallopian tubes or gall bladder?

[If on direct testimony the doctor has omitted to mention a pelvic examination and upon cross-examination he says he has described everything he did and all he found:]

Do you know whether this woman has any local pelvic irritation resulting from laceration of the cervix, endometritis, anteversion, retroflexion, uterine prolapse, salpingitis or ovarian displacement?

In your experience as a medical man have you ever come across cases in women who suffered from backache, headache, increased pulse, excessive reflexes and an "appearance of nervousness" that was due to or might have resulted from any of the pelvic disorders above named?

Suppose the plaintiff in court has concluded the presentation of evidence and announces, "We rest." And suppose further that as a doctor acting in the capacity of the company's adviser you feel convinced that the plaintiff's medical case is vulnerable and can be successfully attacked, how do you proceed? My method, after studying carefully the plaintiff's case during its presentation and deciding what I believe to be a more plausible and accurate explanation of her physical condition, is to recommend putting on a strong medical defense based upon defendant's theory. Do not be satisfied by simply offsetting plaintiff's doctor with a medical man who will offer a counter-opinion. Back up your judgment by opposing plaintiff's medical theory with two medical expert witnesses to her one, or three to her two, as the case may require. Prove this part of your case by a preponderance of the evidence. If properly done, this should be convincing to a fair-minded jury, and if it fails, your record is in much better shape for a reviewing court. In addition you should use your best efforts to outdo the plaintiff in the quality, standing and experience of your medical witnesses. Confer freely with the company's trial attorney; assure him that the theory you have outlined is confirmed and borne out by the experience of the best men in your profession, and if he so desires, make full notes for his use while questioning your doctors. Your final step in preparation is to consult with competent, high-class and skilled specialists—surgeon, internist, gynecologist or neurologist—and in this way back up your contention by presenting to the court and jury convincing evidence by real medical expert witnesses.

I think I am safe in saying that in compensation cases in our state 50 to 60 per cent of the reversals by the Supreme Court are based upon the medical theory introduced by the respondent as being more plausible and reasonable, the language of the court in substance being: "We cannot confirm an award based on speculation, conjecture or doubt."

THE accident cost to the street railways of the country growing out of motor vehicle operation is not far from \$20,000,000 annually, to say nothing of the cost resulting from collisions with persons on foot who use the highways, or the loss of lives and limbs to individuals.

—RUSSELL A. SEARS.

The Company Doctor and Litigation*

By Benjamin E. Sibley, M.D.

Surgeon Boston Elevated Railroad



Dr. B. E. Sibley

MY EXPERIENCE indicates that a standard form of accident report is of great value, since its main divisions may be made comprehensive enough to cover all cases and by following the form the examiner will always be reminded to secure and record data relative to every phase of each case. Such a skeleton report may well express the views both of the company doctor and the company attorney on what information the doctor's report should contain. A blank form I am using, at present, is as follows:

Name, address, occupation, age, date of injury, date of examination, place of examination, those present at examination, claimant's physician, physician's statement, claimant's story of injury, past history of claimant, physical examination, conclusion and opinion.

Without attempting to discuss each of these headings, let us consider first the physician's statement.

The statement of the claimant's physician is important, because it gives us the first information about the nature and severity of the injuries sustained. The sooner after the accident it is secured the better. Furthermore, getting definite statements about what the physician found

soon after injury puts him on record, before his impressions are changed or modified by the afterthought of the claimant, his friends or his attorney. Such an opinion, given early in the history of a case, will more nearly represent the doctor's real views than one obtained later or given for the first time at trial.

After the doctor's statement I get the claimant's story of how his injuries were sustained. This inquiry should be painstaking, to bring out clearly just how the injuries were received, the direction of forces operating to produce trauma, the force of blows, etc. It is very important to quote the claimant's own words on many points.

With this story in mind, the examiner will quickly note whether the injuries he finds are reasonable results of the accident or whether the alleged injuries are not of such character as to be caused in the manner described.

Here again an early history is important and the exact quotation of the claimant's words most valuable. His exact words, describing his injuries, incorporated in the original report help to prevent enlarged claims later and convey to judge and jury a strong impression that the claimant actually did say just what the doctor's report states and not that the doctor got a wrong impression or only part of what the claimant meant to say.

It is well, however, for the examiner to be on his guard, in taking down the story given, not to present in his report a picture which the claimant or his lawyer is drawing for him. I mean that a clever attorney may coach his client in the kind of a story to tell and the latter may get the examiner unwittingly to overload his report with tales unfairly favorable to the claimant.

I conclude this portion of my report with a concise list of the claimant's present complaints. This group has a tendency to grow and at trial may hardly be recognized, so that the list made at examination may serve as a valuable check.

I also make a brief inquiry into the past history of the individual. Even if the past history seems to have no vital bearing on claims made at time of examination, it may have a vital bearing on claims made at the trial.

Former injuries or diseases may be noted, which are caused by pathological conditions, alleged to be the results of recent injury. Or, if such happenings are denied, information from hospital records or other sources may establish the fact of former injury as the cause of present disabilities, and this will weaken or destroy the claimant's credibility.

PHYSICAL EXAMINATION

The physical examination should be comprehensive and include more than the parts alleged to be injured. A brief but adequate picture of the entire patient should be given, with a careful, detailed description of the parts injured. The doctor should record conditions just as he finds them. He should not try to minimize them but endeavor to give them their true value. Upon his statement of injuries found the claims agent depends in settling cases and paying damages, and the company's attorney depends in deciding whether to fight the case or not. As important, also, as a true picture of injuries found is the doctor's opinion of their importance and their probable after effects. I find it advisable many times to give a supplementary, confidential report, not embodied in the formal one. This document may contain views which could not wisely be put in a report that might appear in court.

For example I might wish to state that certain symp-

*Abstract of a paper presented at the annual convention of the American Electric Railway Claims Association, Cleveland, Ohio, Dec. 3 to 7, 1927.

toms following injuries, such as dizziness, headaches, etc., often persist for long periods. It is manifest that for the company doctor to include such remote possibilities in his report of a particular case where there was no actual likelihood of them being true, might prove unfairly damaging, but he might like to call attention to that possibility. The formal report should therefore reflect the doctor's true personal estimate and not contain extraneous impressions, which might be construed to give an inaccurate view of the case.

The value of the doctor's testimony in court rests largely on his general intelligence and honesty. On the witness stand he should establish a reputation for honesty by giving his real opinion on questions asked, whether that opinion seems primarily to favor the company's interest or not.

Doctors who will not make an admission which might be detrimental to their side do not render as valuable services to their company as those who give honest answers, whatever they may be. But in giving these answers the doctor's general intelligence must come into play. He should not allow himself to be led into a discussion of subjects not relative to the case. When asked his opinion on irrelevant matters or on subjects with which he is not familiar, he should not hesitate to say "I don't know." He should remember that he is not expected to know everything, even in his own profession.

The more the doctor tries to express opinions on subjects on which he is not well posted, the more trouble he will have. The real issue may be so befogged that the value of his testimony on subjects he did know about will be lessened or lost.

Should the Company Doctor Attend the Claimant?*

By Dr. Ernest W. Miller

Milwaukee Electric Railway & Light Company

SHOULD the company doctor attend the claimant? Emphatically, no. The company doctor, as such, has no place in the medical world. The term "company doctor" or "company physician" has long enough suffered the stigma of criticism and has long enough carried with it some unfavorable application.

But the surgeon of the industry has a worthy profession and a dignified one and he should attend the claimant.

For many years past and on every occasion possible I have attempted to elevate the plane of the surgeon of industry above that to which the old title has carried it. It is only by constant endeavor along these lines that we shall be able in the future to bring to this field the acknowledgment it deserves.

Last year, in this section, a paper was presented offering many points in favor of non-attendance upon the claimant. Such a policy may be entirely applicable in

*Abstract of a paper presented at the annual convention of the American Electric Railway Claims Association, Cleveland, Ohio, Oct. 3 to 7, 1927.



Dr. E. W. Miller

a community with which the writer was familiar. The problems of the various railways are local, and it is quite impossible to apply any fixed plan to all operating properties. My opinion is based upon my experiences of attending the injured as a surgeon of the industries for the past sixteen years.

The policy of the organization involved may be to treat: (1) Cases of liability only; (2) cases of all injured patrons; (3) cases of liability plus some protection settlements. After experience with each I believe the most desirable is the one we follow—namely, the first, or treatment of claimants where definite liability exists.

To do so satisfactorily, a thoroughly organized medical staff and staff of competent first-aid men are essential. This means also one or more men qualified to do all kinds of major surgery, traumatic and general. There must also be a close co-operation between the medical and claims departments.

In the event of injury, major or minor, the patient is assured not only of first aid but of complete treatment of the highest character. This certainly is to his material advantage. The advantage to the company cannot be overestimated. The contact of a competent, respected surgeon of a community alleviates many of the conditions which naturally arise between the individual claimant and the adjuster. Disability, if any, is reduced to the minimum, and the returns to the company are definite.

The surgeon of the industries should be equipped to the last word in his profession. He must put forth his best efforts, as any successful professional man must do. My experience forces the conclusion that it is possible for an organized medical service to treat practically all of the injured patrons where liability exists.

The patient who is imbued with the idea that he or she is receiving the best possible medical attention must have confidence in the physician, which leads to successful treatment of the patient. With recovery, both mental and physical, a sane approach is laid for adjustment.

Uniform Traffic Regulation*

By Russell A. Sears

General Claims Attorney, Boston Elevated Railway

Its advantages are set forth, together with the applicability of the Hoover Conference recommendations



R. A. Sears

CONFERENCES concerning motor vehicle operation held at Washington, the first in 1925, the second in 1926, popularly and appropriately known as the Hoover Conferences, may be considered as important epochs in the history of the development of the nation.

In no national conference since the Constitutional convention was there displayed a greater, more wholehearted and unselfish intention to prevent or reduce the great loss than was shown by the delegates in those conferences. Every state in the Union was represented, and the personnel of the conferences was a cross-section of the citizenship of the country. More than a dozen committees composed of eminent and able men had met preceding the two convention meetings and prepared the way for action without loss of time. After a full and free discussion the work of the convention was embodied

in the "uniform vehicle code," with which you are more or less familiar.

That the electric street car is a very important factor in the safe regulation of traffic needs no comment. In all probability the accident cost to the street railways of the country growing out of motor vehicle operation is not far from \$20,000,000 annually, to say nothing of the cost resulting from collisions with persons on foot who use the highways, without mentioning the loss of lives and limbs to individuals. Hence as an economical problem alone, anything or any means that will reduce these losses is worthy of consideration.

There isn't a recommendation made by the Washington conference or in the uniform vehicle code to which the street railways can object concerning rules for the safe operation of vehicles. Hence we should interest ourselves in the observance and practice of those recommendations, and we have a further reason for our interest in the recommendations in that many of the railways are at present operating motor-driven buses. A study of the conference reports will also prove of help. Without going into the relative importance of street cars and motor vehicles in the transportation of the public, this much we are sure of: Both street cars and automobiles are here to stay, at least for the present, and any advice as to the operation of both should be welcomed by us.

Each delegate attending the conference should carry to his own state its message and advice. As the subjects dealt with in the conferences are of the highest importance to street railways, should we not ally ourselves with those carrying on this work? This would seem to be simply intelligent self-interest. As many other conferences are being held, at least in the eastern part of the country, of automobilists to promote safety on the highways active association with such bodies would seem to be appropriate for a street railway man so that the association may have the benefit of his experience and he share theirs.

If there is no body corresponding to an automobile safety association near by, then it is desirable to sit in with any neighboring safety association. Whatever be its function, the subject of automobile accidents is always pertinent and the reports of the Hoover conference constitute the best chart in existence from which one can always find his position and the direction in which to proceed.

At least we in Massachusetts think so, and we try to think and do in practical terms. As this is written the Governor of Massachusetts, prompted by the recommendation of the Hoover conferences and the two state conferences called by him, has offered valuable trophies to the three cities and towns having the best record concerning highway accidents for the six months beginning June 1, 1927.

What does this mean—an offer to award distinction on the residents of the city or town excelling in care on the highway? Isn't it apparent that care of persons in the streets and highways has a tendency to reduce highway accidents—and who would profit more as a class than the street railways? Finally, may I recommend this? Send to the Secretary of Commerce for a complete set of the committee and conference reports and recommendations concerning highway accidents, read them carefully and then deny, if you can, that you are more informed than before and hence better equipped to carry on your own work.

*Abstract of a paper presented at the annual convention of the American Electric Railway Claims Association, Cleveland, Ohio, Oct. 3 to 7, 1927.

American Committees Continue Research

Important changes in constitution the feature of reports this year. Other reports on motor vehicle information, education, insurance, rapid transit and taxation presented

CHIEF among the reports of committees of the American Association this year is the one on revision of the constitution and by-laws, which was adopted in its entirety at the convention of the association held this week. The changes provide for the admission of independent bus operators under certain restrictions, revision of the financial structure of the Advisory Council and a change in the dues.

Continuing the custom of the past two years, these reports were not read at the convention, and this year for the first time, except for the constitution changes, they were not made the subject of special mention. Abstracts of the reports follow.

Rapid Transit

IT WAS the opinion of the committee on rapid transit that the most important problem this year was to present an authoritative analysis, from the viewpoint of an economist with adequate training, experience and standing, as to the proper allocation of the burden of cost in building rapid transit.

For some years the committee has been collecting all the available data on this subject, but felt the need of obtaining a study from a purely economic point of view. For this task it obtained the services of Leslie Vickers, economist of the association. He was given an entirely free hand in the preparation of a review of the economics of rapid transit which accompanies the report.

Mr. Vickers' study does not present exact formulas or specific detailed plans applicable generally, but advances principles on which the procedure in each city should be based. In his treatment he considers rapid transit as a special phase of general urban transportation by common carriers. The rights of the latter have been recognized in our commercial and industrial scheme for many generations.

Mr. Vickers says that the need for rapid transit has grown with the economic development of our cities into residence and business districts widely separated, which in turn is caused by the high degree of specialization reached within industry and commerce. The study points out that although few cities have any rapid transit facilities today, many are calling for them on account of street congestion. New surface routes are possible only in the smaller cities, where land values are low. In the larger cities new street facilities must be either elevated roads or subways.

New thoroughfares confer benefits on four distinct groups, according to Mr. Vickers. These are (a) the city as a whole; (b) the property owner; (c) the car rider, and (d) the automobile

owner. He concludes that new thoroughfares should be paid for by all who benefit by them and not only by the group that uses them.

The study further points out that the city's share of construction and equipment can be met by taxation, the property owners by assessment, the car riders by taxation and the automobile owners by license fees and special taxation, without inflicting hardship on any one group.

No rule is laid down applicable universally as to the proportions of these payments or the means of collecting them. In each city where rapid transit



G. A. Richardson

is proposed, a local survey, free from the influence of politics, is recommended.

In an appendix to the report the committee presented extracts from reports and documents relating to the consideration of plans for financing rapid transit in Philadelphia and Boston, together with some extracts of suggested procedure on the physical development of rapid transit in Boston.

Combined with the reviews and extracts of opinions included in previous reports of this committee, the 1927 rapid transit report concluded the survey which the committee has conducted for

several years and which has resulted in bringing together an exhaustive analysis of the fundamentals of rapid transit as reflected by men of various schools of opinion interested in the subject.

The report was signed by H. L. Andrews, W. B. Bennett, Edward Dana, J. S. Doyle, S. E. Emmons, H. E. Ehlers, B. J. Fallon, Thomas Fitzgerald, R. F. Kelker, Jr., E. J. McIlraith, W. S. Menden, D. W. Pontius, F. H. Shepard, C. E. Smith, J. B. Stewart, Jr., D. L. Turner, James Walker, J. H. Alexander and G. A. Richardson, chairman.

Revision of Constitution and Bylaws

CHANGES proposed in the constitution of the American Electric Railway Association, as outlined by the committee, were made necessary mainly for the following purposes: (1) To broaden the statement of the objects of the association to accord more nearly with actual practice; (2) to make it possible for the executive committee to admit, with proper restrictions, companies operating any form of urban or interurban transportation systems; (3) to correlate more effectively the relation between the national association and the geographical railway associations throughout the country; (4) to provide for "plural voting" when demanded; (5) to consolidate the finances of the advisory council with the finances of the main association; (6) to revise the schedule of dues to the association.

In the discussion of the reasons for these proposed changes the committee pointed out that the actual work of the association involves discussion of all forms of urban and interurban transportation—not only electric railway but every other form, including buses. It was felt desirable that the statement of objects should be indicative of the broad function of the electric rail industry, which is to provide transportation in the community by whatever agency is best fitted to the particular task at hand.

Regarding the second reason for the changes, the committee explained that some of the present members of the association in smaller communities represent companies which have abandoned rail operation and have turned to buses but which have continued membership under the old constitution. There are, the committee pointed out, similar companies which have not gone through the rail stage and which under the old con-

stitution cannot join the association. There are also dependable bus companies operating in conformity with the association standards but not technically coming under the definition of subsidiary or affiliated companies of rail organizations, which the association might desire to admit as members. In the proposed constitution effective safeguards have been thrown around the election of such companies so that the membership may be protected against the admission of companies the interests and practices of which might be inimical to those of the association or of any of its members.

Since the American association does not have geographical sections, it was considered desirable to provide a class of membership for the existing sectional railway organizations, as such, in order

expenses were supported by contributions from member companies separate from dues. This made double machinery for the collection of funds from the industry in supporting what is essentially one activity and it was felt by all those concerned with the matter that it would be much more equitable in the long run to readjust the schedule of dues so that the financial side of all American Electric Railway Association activities would be consolidated. Careful studies were made by a subcommittee thoroughly representative of the various classes of membership, and the schedule of dues was arrived at as a more equitable method than the old system of dealing with the various classes of members.

The report was signed by J. G. Barry, H. V. Bozell, H. L. Brown, H. C. Clark, F. W. Doolittle, J. E. Hutcheson, M. B. Lambert, E. B. Meissner, L. H. Palmer, Harry Reid, G. A. Richardson, Paul Shoup, R. P. Stevens, J. H. McGraw and C. D. Emmons, chairman.

Insurance

COLLECTION of a two-year history of insurance experience was continued. The number of companies reporting this year was 35 more than a year ago, with \$68,000,000 more insurance and \$145,000 more premium. Tables which accompany the report show for the 279 companies allocating insurance to types of property covered, insurance carried, premiums paid, rate, losses and amount recovered, also the same data for 60 companies which do not allocate their premiums to the types of insurance carried. The committee also points out that the loss ratio is declining.

At President Sawyer's request the committee appointed a subcommittee to give the subject of fire prevention special attention. The conclusions in brief follow:

Too much emphasis can hardly be laid on fire prevention for street railways. It often appears that where several methods of reducing a particular fire hazard possess equal merit, one is accepted by the insurance authorities as the best and if followed, a maximum insurance credit will be obtained. The Engineering Manual Section B-100-23 contains some very helpful suggestions and recommendations on this subject. The Crosby-Fiske-Forster Handbook of Fire Protection is a nationally recognized authority on all matters of this sort, as are the various pamphlets published by the National Fire Protection Association.

It is advisable to submit plans of all new construction to the local rating bureau, or your insurance broker if he is in a position to furnish insurance engineering service, before the work is started, to obtain their suggestions regarding details of construction and fire-extinguishing equipment. Where automatic sprinklers are to be provided, the plans should provide that the work be done so as to conform to the bureau requirements.

In the effort to cut down expense on new construction, it is easy to allow fire hazards to creep in when, if fire prevention were properly considered, the additional expense involved would save a great deal more than its annual carrying cost in lower insurance rates.

Safety and fire prevention go hand in hand, and safety committees should be encouraged to give suggestions which will help to improve the condition of the property. If this places too great a burden on the safety committee, the work may be given to a separate committee organized to follow fire prevention work alone. Such a committee should be drafted from different parts of the organization. The inspections by this committee should embrace all phases of fire protection, including housekeeping, storage of combustible



C. D. Emmons



P. E. Wilson

to tie together the work of all the various organizations in the industry.

The reasons for the provision of "plural voting" are, first, to make it possible to give proportional voting weight, on such matters as the adoption of engineering standards, to those companies whose purchases represent a large part of the equipment manufactured for the industry. In other words, a company that buys several thousands of certain piece of equipment per year should have more to say, according to the committee, about the standards adopted to that equipment than a company that buys only fifteen or twenty pieces a year. The second reason advanced for the provision for "plural voting" was that under the amended constitution permitting admission by the executive committee of bus companies, "plural voting" would provide a check against the possibility of a large number of such small companies becoming a deciding factor in determining the policy of the association. Accordingly, it was provided in the new draft of the constitution that in case a member demands it, plural voting may be invoked and companies will have one or more votes depending on the dues paid.

The last two objects listed by the committee—namely, the consolidation of the finances of the advisory council with the finances of the main association, and the revision of the schedule of dues—are very closely related. Since the organization of the advisory council, its

material and extinguishing equipment. Inspection work will be greatly aided if the employees feel that the management is personally interested in the work. The reports of inspection should be followed closely to see that defects are corrected as soon as possible.

Excellent results have been secured by many member companies in engaging the services of firm whose specialty is fire prevention. This is applying in a larger way the advantage derived in forming fire prevention committees among our own staff and our own employees.

It is essential that all employees be carefully instructed as to what they should do in the event of fire. This includes giving the fire alarm, use of fire extinguishers, running out of hose, the removal of essential records and property, etc. From time to time fire drills should take place to be sure that each person not only understands what he is to do but knows exactly how to do it.

Good housekeeping is largely the result of a habit of mind. There is nothing that so influences a clean mind as a dirty workshop or a dirty street car. Therefore street railway managements should lay great emphasis on the subject of good housekeeping, the result of which will be not allowing waste to accumulate about the plant. Any infraction of fire prevention rules should be followed up as strenuously as infractions of rules for operation of cars, the handling of revenue and all of

the other ramifications of our business.

The committee recommends that it be continued another year with authorization to negotiate with insurance rating authorities for a reduction in the rates applying to street-railway properties. Such negotiations, naturally, will require the closest co-operation of the membership. The data collected indicate such rate negotiations are warranted.

The association statistician, Mr. Murphy, has again been invaluable to the committee.

The report is signed by O. H. Bernd, Edward J. Blair, A. C. Blinn, Granville H. Bourne, C. E. Brown, W. C. Campbell, N. H. Daniels, Samuel W. Greenland, F. M. Hamilton, L. R. King, A. D. Knox, F. H. Miller, John H. Moran, A. B. Paterson, F. J. Petura, B. L. Tones, Edward A. West, H. B. Potter, vice-chairman, and Paul E. Wilson, chairman.

Education

IN LAYING out its program for the past year the committee decided not to try to cover too much ground, but to confine attention principally to continuing the work of last year along lines that seemed most promising.

The advisability of conducting another demonstration conference was considered, but the committee concluded that the purpose of that demonstration had been accomplished as far as it could be by that means. This purpose was to arouse interest in the conference form of instruction and to stimulate the holding of such conferences on as many railway properties as possible.

Omitting numerous intervening details, the outcome of the committee's discussion and correspondence was a plan for a "Training Course for Foreign-Conference Leaders" to be held in connection with the Cleveland convention. The conferences will be conducted by A. J. Sarré, of the New Orleans Public Service, Inc., and Henry H. Norris, of the Boston Elevated Railway, with the assistance and co-operation of Frank Cushman, of the Federal Board for Vocational Education, Washington, D. C.

The invitations to enroll in the leader-training course went out early in July, to permit correspondence with the registrants during the summer. Last year five letters with enclosures were sent by the committee to the members of the foreman-conference group. The result was the building up of a spirit of solidarity which facilitated the starting of the discussion at Cleveland.

The committee and the men in charge of the training course for foremen-conference leaders wish to emphasize the preliminary nature of this series of conferences. In six sessions of four hours' duration it is impossible to furnish the equivalent of the longer courses available at other times and places for this purpose. The course can form only a part of the training desirable for conference leadership. It is hoped, however, that as far as possible the men selected may be those who have already

made a start in this field. The course also should be followed by reading along the lines suggested by the instructors.

Another subject which appealed to the committee as urgent at this time is the instruction of car operators, particularly along lines of courtesy, skill in giving good service, interest in the job, etc. A questionnaire was sent out to ascertain the present practice in post-employment instruction. The returns indicate a substantial interest in such training, but show that there is a wide field here for study and improvement.

A representative of the committee



Edward Dana

attended the twelfth annual convention of the Engineering Extension Division, Pennsylvania State College. A foreman-conference demonstration was a feature of that convention.

In the course of its researches the committee learned of much educational and training activity that could not be covered statistically. It is impracticable to include accounts of all of this in the present report, but typical descriptions are appended to indicate the trends of the best present-day educational effort.

The committee has been greatly encouraged by the interest of the industry in its efforts. These appear to be producing results. The "educational director," or his equivalent is increasingly in evidence on electric railway and allied properties. The committee desired to make a definite contribution to this development this year and to avoid spreading its activities over too wide an area. Co-operation by the industry in the leader-training course will insure such a contribution.

Following the committee's established custom, a bibliography is appended to this report referring to some of the important recent articles in the field attempted to be covered by the committee. This makes no claim for exhaustiveness, and the committee will welcome additions which can be included in the revised report.

The report was signed by H. H. Adams, George B. Anderson, A. H. Armstrong, W. H. Boyce, W. H. Burke, John A. Dewhurst, M. B. Lambert, R. J. Lockwood, M. McCants, F. H. Miller, Henry H. Norris, Arthur J. Rowland, A. J. Sarré, T. H. Tutwiler, J. S. Hyatt, vice-chairman, and Edward Dana, chairman.

Motor Vehicle Information

QUESTIONNAIRES were sent out to determine the trend of motor bus operations as affecting the electric railway industry. The results of this questionnaire follow:

1. Will the electric railways in your section purchase and operate appreciably more buses in 1927 than in 1926?

As a broad generality the trend still appears to favor the operation of appreciably more buses by electric railways this year. From the number which reply in the negative, however, it seems more accurate to conclude that a substantial part of the electric railways have now reached the limit to which they intend to expand their bus operations, while a larger number, who perhaps have undertaken bus operations more recently, still contemplate substantial increases in that form of service.

2. Will these buses be used to supplant electric cars or to furnish additional transportation service?

A marked uniformity of opinion is expressed in the responses to this query. New buses to be operated this year will function largely as feeders, in crosstown service and generally supplementary to the existing railway service of the electric railways concerned. Only in small cities does there appear to be any intention of supplanting the street cars with buses.

3. Is the number of buses operated by other than electric railways increasing or decreasing?

Opinion is sharply divided on the trend of independent operations. One group reports increased independent operations, while nearly an equal number find the situation stationary or decreasing. Where increases are noted they apply largely to interurban operations and not always in competition with electric railways.

4. Are the buses now being operated by the railways and by others making a fair return on the investment?

It is the consensus of opinion that bus operations are not yielding a fair return on the investment. Interurban bus service seems to be generally more remunerative than city bus operations.

5. What is the trend of bus design in your section—toward larger or smaller buses?

Apparently many operators have already standardized on bus sizes which in their opinion best fit the local traffic requirements. Our replies indicate that 21 to 29-passenger buses are the average in city service, with larger buses on interurban routes. Where any trend is noted, it is almost uniformly toward larger vehicles.

6. Is the trend toward more luxurious buses or toward more passengers per 1,000 lb.?

A broad uniformity of opinion allows of two definite conclusions:

First, that interurban bus design tends toward more luxurious equipment, while with city buses the trend is toward lighter cars of plainer but more comfortable design; and

Second, that the trend is decidedly

toward better buses—i. e., buses of structural stability, with six-cylinder motors and durable finish; buses designed with special consideration to reasonable life and low maintenance cost.

What is the trend of the schedule of buses—faster or slower?

In the southern sections the responses largely reflect a trend toward faster schedule speeds. While this appears to express the general purpose, many report slower schedule speeds resulting from traffic congestion.

Is there any change in liability insurance premiums, either higher or lower?

Several reported the appropriation of additional funds to injuries and damages reserve for the purpose of carrying their own insurance. The majority reported no change in liability rates and none reported lower rates.

What is the rate of fare tendency?

In no case is there any downward tendency in the rate of fare; the majority, regardless of their desires, anticipate no change, but several indicate an upward tendency.

When buses operated by independent operators are obsolete or otherwise unfit for use, is the tendency in these cases to abandon the lines or buy new buses?

With approximate uniformity the responses reflect tenacity in the independent operators and an ability, with the aid of time payments, to replace their equipment.

Are the bus manufacturers solicited in business in competition with electric railway operated lines? If so, who?

A substantial majority exonerate the bus manufacturers from the implication of undue efforts to establish independent competitive operations.

What is the tendency toward freight haulage by trucks in your territory?

While some replies indicate a comparatively small increase in freight haulage by trucks, nearly all agree that an increase, either large or small, is taking place; and none report a decrease.

To what extent have unregulated interstate bus lines been established and what is the tendency toward an increase or decrease in this kind of operation?

Some observers located centrally in the respective states note little if any interstate bus operations, but the majority report a small to large interstate bus business—mostly increasing.

What other indications do you see in your territory that have bearing on the tendency of future bus operations?

As far as such a leading question might be expected to result in any uniformity of reply, it may be said that several look for increased bus operation. Among the comments we find the expectation that bus operation in the future will tend to become concentrated largely under the management of the electric railways and the anticipation that the continued increase in the use of the private automobile will have the greatest bearing upon future bus operations.

15. What, in your opinion, should the executive committee of the association be giving particular attention to in regard to the bus situation?

In the field of legislation four companies direct the attention of the executive committee to the need for state or interstate bus regulation in their respective territories. Others suggest that the executive committee should investigate and give wide publicity to (1) the relative function of the railway and bus, and effect of bus competition upon electric railway operations; (2) the relative cost of bus and electric railway operations when equally burdened in respect to service regulations, taxes and liability for injuries and damages; and (3) the unseen cost of bus operation which the public pays through the various forms of taxation that provide for the upkeep of the highways.

Among the replies we find the promulgation and prompt adoption of a uniform system of bus accounting very strongly urged, while efforts toward standardization of bus design and elimination of high-pressure sales policy of bus manufacturers toward prospective bus operators are suggested.

The report was signed by Joseph H. Alexander, Carl H. Beck, M. R. Boylan, Luke C. Bradley, F. G. Buffe, H. B. Flowers, M. B. Lambert, D. W. Pontius, Harry Reid, R. B. Stearns, W. B. Tuttle, E. P. Waller, S. B. Way, vice-chairman, and R. P. Stevens, chairman.

Taxation

CONSIDERATION during the past year has been given to the problem of the complicated and discriminatory tax systems which now prevail in most states against street railways. In many states street railways are carrying a greater tax burden than is now carried by other public utilities or by mercantile and manufacturing corporations. This fact was very clearly established for New York State by the survey made a few years ago by the special joint legislative committee on taxation and retrenchment, of which Senator Frederick M. Davenport was chairman.

A survey conducted by the advisory council of this association in 1925 and 1926 showed that street railway companies in the various states were faced with inequitable tax burdens similar to those existing in the State of New York.

It is self-evident that when any industry is compelled to pay more than two-thirds of its net revenue in taxes, relief of some sort should be furnished.

We are calling attention to the above inequalities of taxation, not for the purpose of establishing that any other public utility is not paying a large enough share of the tax burden, but merely for the purpose of showing that any system of taxation which produces such inequality must be wrong in principle.

The report of the New York committee referred to, recommends the adoption of a tax on public utilities based on the elements of both gross and net income and said that such a tax would

possess the advantages of certainty, simplicity and equity. Your committee on taxation has devoted its entire attention during this year to the question of whether it should recommend to this association the adoption of the principle of a gross net tax on street railways in lieu of all other forms of state and local taxation, such gross net tax to be apportioned by the state authorities among the various municipalities or governmental agencies of the state.

It is realized that the street railway industry is now faced with a tax system which has grown up historically by piecemeal legislation applied at different times to different classes of corporations, with the result that such tax system has the defects of uncertainty, arbitrariness and complexity. It is further realized that the street railway industry is now paying an unjust and discriminatory portion of the tax burden of the various states and that some simple and equitable form of taxation should be substituted in place of the present complicated and discriminatory tax systems which now prevail in most of the states.

The gross net tax, such as suggested by the New York legislative committee, would impose a minimum tax on the gross revenue from operation of street railways, even though its net revenue from operation was small or non-existent, and the rate of tax would increase in the case of such street railways as had a net operating revenue, such rate of tax being increased in the proportion that the net operating revenue bore to the gross operating revenue. The gross net tax, therefore, has, first, the element of simplicity; second, the element of equity, in that the rate of tax is graduated according to the ability of a particular street railway to pay such tax, and, third, the element of insuring a permanent stable revenue in that it provides for the imposition of a minimum tax on gross revenues from operation irrespective of whether or not a street railway has a net operating revenue. At a meeting of the committee on Dec. 10, 1926, a vote was taken by the members upon whether it should recommend this form of tax to the association. The vote was 9 in favor and 1 opposed.

The members felt that in view of the importance of the subject and that a full membership of the committee was not present, a subcommittee should be appointed, with the chairman of the committee on taxation as chairman, to prepare a report to be submitted to all the members of the committee for their action by letter, vote or otherwise. This report has not yet been completed, and the committee on taxation asks that it be continued for another year so that it may act upon the question to be submitted by the subcommittee.

The report was signed by Charles H. Allen, B. J. Denman, Robert M. Feustel, Albert W. Flor, Harold L. Geisse, James P. Griffin, Daniel J. Hennessy, William A. Jackson, H. A. Mitchell, L. R. Nash, D. J. Strouse, C. L. S. Tingley, A. C. Watt, Paul E. Wilson, Edward W. Wakelee, vice-chairman, and Alfred T. Davison, chairman.

Latest Developments in Accounting Methods

Reports of committees of Accountants' Association summarize progress during the past year. Wide range of subjects covered illustrates scope of electric railway business

MUCH activity characterized the work of the committees of the Accountants' Association during the past year. The classification of bus accounts adopted at the 1925 and 1926 conventions was adopted by the National Association of Railroad and Utilities Commissioners last October. The report of the committee this year is one of progress. No requests for a revision have been received, nor has it been found necessary to issue a condensed classification.

Abstracts of this and the other reports presented follow.

Stores Accounting

THE SUBJECT chosen for study and report was storage, distribution and accounting for gasoline, oils and grease used on buses and automotive equipment. Seventeen questions were sent out to 55 companies. Forty-one companies responded. Due to varying conditions the committee made no extended recommendations.

The answers showed that the amount of gasoline purchased a month ranged from 3,000 to 1,000,000 gal. and that the average for the 41 companies reporting was about 58,713. The total purchases of gasoline for the year of these 41 companies was about 28,900,000 gal., having a value perhaps in excess of \$4,500,000. These figures show the



R. A. Weston

desirability of following the best practices to eliminate waste and to insure statements of cost as correct as possible.

Twenty-five companies purchase gasoline in tank wagons, seven in tank cars, three in both tank wagons and tank cars, two in both tank wagon and from service stations, two from service

stations and two companies did not report. In general the capacity of the storage tank is for a few days only.

For measuring the gasoline delivered, seven companies use tank wagon measurements, two companies use standard-size cans and two companies use gage tank cars. The remainder measure shortage in the tank. In general, the method followed in checking the quantity of gasoline delivered is by means of wooden calibrated sticks. One company that receives by tank car gages the car and figures for temperature correction.

In receipting for gasoline, some companies use special receiving forms and others use regular receiving receipts. The receiving record is checked against the invoice generally. Only two companies carry large enough supply so that advantage can be taken of trend of market. Most companies have small-capacity tanks.

Inventories are taken at various times as follows: yearly by one company, semi-yearly by one, monthly by fourteen, daily by five and at various times by eleven. No inventory is taken by two companies and no report was received from seven.

No companies reported any great amount of trouble from the accumulation of water in their tanks.

On the question of loss through evaporation, wastage or other causes one company reported an estimated loss of from $1\frac{1}{2}$ to 2 per cent and one company 1.75 per cent. The rest estimated less than 1 per cent or had no available data.

Sixteen companies gas their buses from storage points, nineteen from storage points and public stations, one from wagons and public stations, one from storage and wagons, two from public stations and two companies made no report.

In accounting for the gassing and oiling of buses twelve companies use material and supplies requisition and eighteen



L. E. Lippitt

Retiring President Accountants' Association

companies use special gas and oil requisition.

Gasoline is purchased under a year's contract by 23 companies, under monthly contract by one and under various other kinds of contracts by six. Nine companies have no contract and two companies made no report.

Twenty-seven companies maintain special ledger account for gasoline, thirteen do not; one did not report.

Twenty-nine companies carry oils in their stores account, seven companies charge this material direct to the proper account and five companies did not report. With grease, twenty companies carry it in stores account, twelve companies charge it direct and nine companies did not report.

Among the companies reporting on forms used in gasoline and oil accounting, the one that has gone most extensively into the operation of buses and whose consumption of gasoline is approximately 1,000,000 gal. a month, reported its methods in considerable detail. Briefly, they are as follows:

Blanket requisitions on the purchasing agent are prepared by the stores department. One requisition is made for gasoline covering delivery at all points. A separate requisition is made for each kind and grade of oil and grease. The requisitions also specify that the material

als are to be delivered as required and that when the vendor makes deliveries, the company's order number must be indicated on the delivery slip left at the delivery points by the drivers of tank wagons. Purchase orders to conform to the wording on the requisitions are issued by the purchasing department.

As gasoline, grease and oil are required at each point the vendor is notified, but at points where there is a large consumption this is not necessary, as the vendor becomes familiar with the requirements and makes deliveries at regular intervals. When each delivery is made, the clerk or foreman measures the contents of the tank; then he sees that the tank wagon compartments are all before being emptied and that these compartments are empty when delivery is made and again measures the tank after delivery. A receiving report is made on a special receiving card, showing the date, by whom delivered, what delivered and the quantity, the vendor's delivery ticket and tank wagon numbers, the order number, and stating that the tank wagon compartments have been observed before and after delivery. The tank wagon contents are taken out by can, a statement to that effect is made in the place provided. The vendor's delivery ticket is attached to the original or paper copy in the receiving card book and the cardboard copy is run out and forwarded at once to the stores department general office.

The vendor renders bills for each delivery made at each point. They are checked, then classified to the proper account. The receiving card number entered thereon, certified as to correctness, listed on a bill statement and forwarded to the purchasing department, where they are again checked as to price and entered against the proper orders. Bills are then forwarded to the auditing department for recording and payment.

As gasoline or oil is put into buses otherwise used, a daily memorandum kept on the quantity, this being determined by measuring apparatus on the pump and tanks, or, in the case of oil, cans. The data on these daily memorandums are transferred daily at each delivery point to a monthly gasoline and oil report. The consumption is totaled by bus numbers several times a month so that the total consumption per bus may be noted periodically at short intervals. At the end of each day the consumption, receipts and quantities on hand (by stick measurements) are checked up and entered at the bottom of the form and the "over" or "short" shown as the case may be. These overs and shorts are carried through to the end of the month, where a net "over" or "short" is arrived at. Then the original of this report is forwarded to the stores department, where it is checked against the record of receipts (from receiving cards) and invoices. It is then forwarded to the auditing department for further checking. The net "over" or "short" for the month is then apportioned against each bus number shown in the report in proportion to the consumption of each bus to the total con-

sumption, for the purpose of keeping a consumption record by bus numbers.

A special supplementary report is made monthly by the stores department to the auditing department of any deliveries made in the month for which bills have not been received, in order that charge entries may be taken up in that month for deliveries not billed.

On a large system it is advisable to have one man take complete charge of gasoline and oil matters, for maintaining relations with the vendors as to details and for the general system of operation as regards fuel and lubricants.

The report was signed by W. V. Shoemaker, W. S. Stackpole, F. E. Wilkin, and R. A. Weston, chairman.

Standard Classifications

DURING the past year the committee received a notice from the Interstate Commerce Commission of a hearing on depreciation for electric railways to be held Feb. 28, 1927, at Washington. This hearing was subsequently postponed to May 23, 1927, and later indefinitely postponed. In view of the



M. W. Glover

fact that when this subject came up for discussion several years ago in connection with a similar hearing before the Interstate Commerce Commission relating to steam railroads, a special committee was assigned to handle the subject by the American Electric Railway Association, the committee felt it would be inadvisable to take any official action in connection with the proposed hearing, even though it appeared to cover an accounting matter, which would presumably be handled by the Accountants' Association. Nothing has therefore been done on this subject other than to keep in touch with developments.

The subject of accounting questions appearing in the question box of *Aera* was brought to the attention of the committee and arrangements were made with the editor of *Aera* that all accounting questions involving an interpretation of the classification of accounts would be sent to the committee before publication, in order that an official answer could be secured when necessary from the Interstate Commerce Commission, in accordance with the arrangement in effect between the bureau of accounts of the Interstate Commerce

Commission and the committee, whereby all inquiries relating to the classification of accounts for electric railways are submitted to the committee before a ruling is issued by the commission.

All accounting questions which do not require an interpretation of the classification will, of course, be published in *Aera* without reference to the committee. The only questions submitted to the committee will be where an interpretation of the classification is involved.

During the year several inquiries were received from electric railways operating in the United States and in Canada. These were submitted to the bureau of accounts of the Interstate Commerce Commission and answers approved by the committee and by the commission were given. [These questions and answers will be published in a later issue of *ELECTRIC RAILWAY JOURNAL*. —Ed.]

The report was signed by H. L. Wilson, I. A. May, P. S. Young, C. S. Mitchell and M. W. Glover, chairman.

Bus Accounting

THE most important development during the past year was the adoption by the National Association of Railroad and Utilities Commissioners at their convention in Asheville, N. C., in October, 1926, of the bus classification of accounts, approved by the Accountants' Association at the conventions in October, 1925, and October, 1926.

This therefore makes the bus classification the standard classification of accounts for motor bus transportation companies and in future this classification will be referred to as the "Standard Bus Classification."

During the past two years the standard classification has been used by a number of companies operating in the states of Connecticut, New York, New Jersey, Pennsylvania, Maryland, West Virginia, Virginia, Ohio, Indiana, Illinois and Wisconsin, and is in use by companies operating in the District of Columbia. The classification is probably used in other states by companies which have not adopted a classification of bus accounts, but the committee has not been able to secure the names of the companies and the other states in which the classification is now in use. Its adoption by the National Association of Railroad and Utilities Commissioners, the membership of which comprises the public service commissions of all states as well as the Interstate Commerce Commission, should result in an increased use of the classification and will promote uniformity in bus accounting throughout the United States, which is very desirable.

During the year the committee has received several questions relating to interpretations of the classification, and in accordance with the authority given at the October, 1926, convention, answers to these questions have been given by the committee. [They will appear in a later issue of this paper.—Ed.]

The General Office Equipment Cor-

poration of New York has issued a pamphlet entitled "Standard Accounting System for Bus Operating Companies," using the standard classification as a basis of the system suggested, and copies of the pamphlet have been furnished for distribution to the members attending this convention.

The chief of the bureau of accounts and statistics of the Pennsylvania Public Service Commission invited the committee to attend a hearing in Harrisburg, Pa., Aug. 17, 1927, to review a proposed tentative classification of accounts for passenger motor transportation companies which has been under consideration by the Pennsylvania commission. A meeting of the committee was held in Harrisburg on Aug. 16 and the tentative classification was considered and compared with the standard classification. The result of the examination of the two classifications showed several small differences. The committee attended the hearing on Aug. 17 and offered verbal suggestions relative to changes in the proposed Pennsylvania classification to bring it in line with the standard classification. The chief of the bureau of accounts and statistics at the close of the hearing invited the committee to submit suggestions in writing and stated that they would be carefully considered before the classification was issued by the Public Service Commission. In response to this invitation the committee submitted a statement under date of Sept. 1, 1927.

It is needless to advance reasons showing the desirability of uniform accounting throughout the United States, and it is hoped that the Pennsylvania Public Service Commission, as well as the commissions of other states, will carefully consider this subject before issuing a classification different from the standard classification, which has been approved by the National Association of Railroad and Utilities Commissioners. The most serious objection to the adoption of different classifications in the various states is the fact that a number of bus companies operate between states, handling interstate passengers, and it would be manifestly impossible for such companies to keep their accounts under two different classifications if the states in which they operated should issue different classifications.

So far no requests have been received

for a more condensed classification than that adopted at the 1926 convention, but if smaller companies feel that a more simple classification is needed, it can be readily prepared from the two classifications now in use, the complete classification being prepared for companies with annual operating revenues in excess of \$100,000 and the condensed classification for companies that have operating revenues of less than \$100,000.

The report was signed by P. R. Jacques, H. C. Kimball, C. R. Mahan, C. W. Stocks, N. E. Stubbs, E. A. Tuson, and M. W. Glover, chairman.

Representation at Convention of National Association of Railroad and Utilities Commissioners

THE chairman of the committee attended the 1926-27 convention of the commissioners, and while he took no part in the discussions he was present at practically all the sessions and discussed matters of interest with members and other guests of the association.



W. L. Davis

Probably the item of most importance to this association was the action taken by the committee on statistics and accounts of public utility companies. This committee, in its report, covered the following subjects: (1) Standard classification of accounts for motor vehicle operations, (2) pending (or possible) revision of the standard classification of accounts for electric railways by the Interstate Commerce Commission, (3)

destruction of records of public utilities. The present status of each is:

1. The committee's report recommended for adoption two classifications, one covering operations with gross revenue of more than \$100,000 per year and the other for operations with gross earnings under that amount. The report states that the uniform system of accounts, made a part of the report, has been adopted by the American Electric Railway Association. In making its recommendations, however, the report was submitted "with the proviso that in so adopting these systems of accounts each state commission or regulatory body having jurisdiction in such matters will have the right to amend or modify such system of accounts in order to meet their own special requirements or needs."

2. The chairman of the committee recommended that the committee appointed to take care of this work during the coming year co-operate with the Interstate Commerce Commission in any changes or revisions in the present classification of accounts for electric railways. The chairman also advised in this same connection, that Chairman Eastman of the Interstate Commerce Commission had been consulted and had approved the recommendation.

3. Recommendations were made that the subject of destruction of records be assigned to the incoming committee, as the present committee had not sufficient time to consider it.

The report of the committee on statistics and accounts of public utility companies was accepted by the convention; hence it will be very essential for this association to follow up the work outlined in sections 2 and 3 above. Possible changes in the situation in connection with a uniform regulatory law (now under consideration) and possible revisions of the electric railway classification may have an effect on the status of the bus classification and the application thereof.

The matter of accounting for renewals, replacements, retirements and depreciation on electric railways was discussed informally by several present at the convention, but it was not mentioned in the proceedings.

The time and place of the next convention was fixed for the third week in October at Dallas, Texas.

The report was signed by W. L. Davis, chairman.

*BUS operation is playing a very important part in the transportation field. * * * It behooves every member of our association to put forth every effort to have our standard classification of accounts for bus operation adopted by all state commissions and used by the bus operators, rather than some time later to find ourselves confronted with a classification put out by the several state commissions. It is highly important that a national standard be adopted.*

—From PRESIDENT LIPPITT'S address to the Accountants' Association.

Definite Recommendations Made by Engineering Committees

Work done during the past year by way and structures and equipment divisions has progressed favorably under new group organization. Additional reports presented on heavy electric traction and power subjects

THIS year the committees studying equipment subjects were grouped under the same general plan as that adopted by the way and structures group a year ago. The reports presented show clearly the beneficial results of this procedure. Committees studying the subjects of heavy electric traction and power generation and distribution continue to work independently. Abstracts of the reports follow.

Power Transmission and Distribution

IN REVIEWING existing manual sections the committee agreed upon data to be added to the section covering insulators for contact bar supports and submitted a drawing.

The committee submitted specifications covering materials for catenary construction. These are designed to be included eventually in a comprehensive specification for overhead line material, for both direct and catenary suspension, which will include the material appearing at present in the manual.

The committee reviewed the specifications for catenary overhead construction for other than steam railroad electrification for the purpose of preparing any necessary revisions. It found that a number of changes are desirable and presented a list of them as information only. The committee felt that there is

still much work to be done on this specification and did not recommend the adoption of these revisions at this time.

The committee continued the study of trolley wire breaks and carried it forward in a manner uniform with that used in reports for 1925 and 1926, covering substantially the same properties.

The committee felt that the data available are still insufficient for a full comparison of results, and it is believed that next year, with four years of uniform data at hand, a more complete comparison can be made and reasonably safe conclusions stated. The committee called attention to the decreasing frequency of trolley breaks, due to both crystallization and wear, at points of support. Attention was also called again to the increasing percentage of breaks due to causes beyond the control of the line maintenance forces, such as burn-downs and pull-downs by cars, etc. This item shows a steady increase



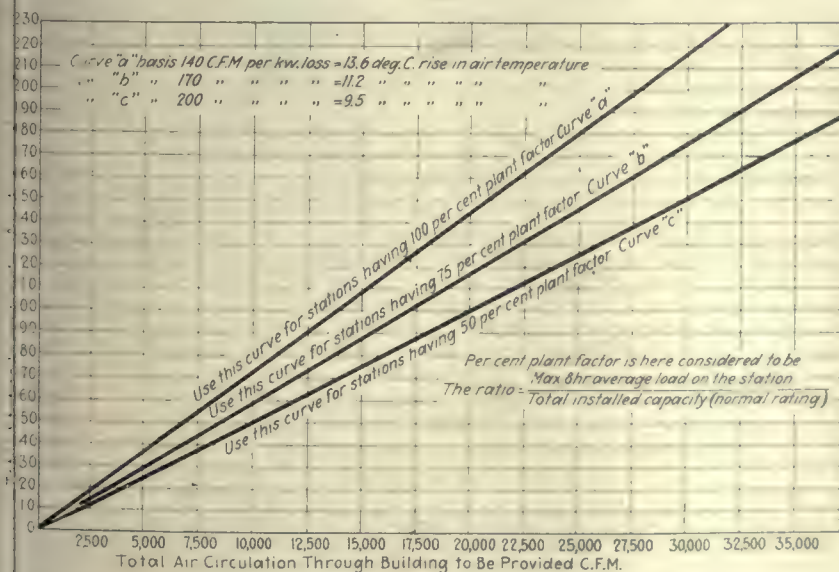
Daniel Durie

Retiring President Engineering Association

from 27.1 per cent in 1922 to 34.6 per cent in 1926.

At a joint meeting of the A.S.T.M. and the association, the specification for bronze trolley wire was discussed. It was shown from the experience of the past two years that the present tensile strength requirements represented selected material and could not be reached by all good and acceptable wire. It was also shown that the per cent elongation in 10 in. for the 133,225-circ.mil size was slightly out of proportion with the requirements for the other sizes. The manufacturers also pointed out that the present requirement (that grooved trolley wire should have 95 per cent of the tensile strength of round wire) was not supported by tests of the material, and there appeared to be no reason why the tensile strengths should not be the same for wire of the same nominal cross-sectional area. It was, however, also brought out that grooved wire would not normally have as great an elongation as round wire, with the result that a reduction in this requirement was agreed upon.

With regard to the twist test, it was shown that the present A.E.R.E.A. requirement was too severe for the large



Total air circulation required through building corresponding to total losses at average load for stations having 50, 75 and 100 per cent plant factor

est sizes and that the A.S.T.M. requirement was not severe enough for the smaller sizes. It was agreed to state a minimum number of twists for each size of wire, at the same time keeping the test as a qualitative test to discover defects.

The changes were embodied in a revised specification which was submitted for approval.

A number of cases of radio interference were brought to the attention of the committee, but in each case the causes had been anticipated and described in the 1926 report. Remedies suggested in that report were applied in a few cases with gratifying results. No new additional sources of interference were brought to the attention of the committee since the last report was made and it is the opinion of the members of the committee that the 1926 report is comprehensive enough to identify nearly all cases of radio interference caused by trolley car operation and to apply a remedial measure.

The committee gathered some data relating to the physical conditions and methods employed on various systems, with the idea of establishing a standard by which the various methods of operating and maintaining overhead lines may be compared. In making a preliminary digest of these, it was found that there is possibly a very fruitful field for investigation, the results of which, it is expected, will set up an arrangement by which an operating engineer may compare his methods of using labor and material and the results he obtains with the methods and results obtained on different operating roads, traffic density and such other factors of wear being taken into consideration.

The committee recommended that this subject be continued next year.

The committee has been in communication with various users of trolley wire reels and found that, with the existing divergence of opinions, no formal report could be made at the present time.

The report was signed by J. Walter Allen, S. H. Anderson, W. H. Bassett, James H. Drew, D. D. Ewing, C. E. Hancock, W. F. Healy, S. S. Hertz, Kirk J. Keith, A. J. Klatte, John Leisenring, H. S. Murphy, W. J. Quinn, M. B. Rosevear, W. Schaake, A. Schlesinger, Dwight L. Smith, R. E. Wade, George F. Wennagel, M. W. Cooke, vice-chairman, F. McVittie, chairman, J. F. Neild, secretary and Charles H. Jones, sponsor.

Power Generation and Conversion

SUMMATION of the investigation made regarding ventilation of automatic substations was given. This was arranged so that with a given machine and knowledge of the load to be carried, the quantity of air to be circulated and the size of inlet and outlet openings may be determined easily under various combinations of plant factor and ventilating head. A brief summary of the tests was given, together with a num-

ber of suggestions to substation designers in the determination of characteristics and arrangement of required ventilating equipment and result in generally improved temperature conditions in substations.

The plant factor on railway substations generally averages less than



F. McVittie

50 per cent. Sustained overloads of as much as two hours' duration occur frequently, however, but these are to some extent counterbalanced by the thermal storage capacity of building structure and equipment as well as of the machines themselves in so far as the required temporarily increased dissipation of losses is concerned. The resultant temperature in the usual railway station, after its customary two-hour overload period, is decidedly lower than that corresponding to a continuous load of the same magnitude because of this thermal storage capacity. It is estimated that the masonry work alone of an average two-unit substation will absorb 72 kw.-hr. per deg. C. rise in temperature. Obviously some advantage can be taken of these mitigating circumstances in the determination of the ventilating equipment which must be provided for dissipation of losses. One means to this end is to determine sizes of openings or fan capacities on the basis of air circulation per unit of loss during maximum eight-hour average load for stations of low plant factor and decreasing the air circulation per kilowatt loss as the plant factor increases in some such ratio as: 200 cu.ft. per minute per kilowatt loss for stations having 50 per cent plant factor, 170 cu.ft. per minute loss for stations having 75 per cent plant factor, 140 cu.ft. per minute per kilowatt loss for stations having 100 per cent plant factor, corresponding to temperature rises of the ventilating air of 9.5, 11.2 and 13.6 deg. C. respectively. Curves were worked up on this basis for total station losses at maximum eight-hour average load, as high as 220 kw. They may be extended indefinitely. The total air circulation to be provided through the building can be read on the lower scale directly below the intersection of the horizontal line corresponding to the eight-hour average losses and the curve corresponding to plant factor.

The free areas of inlet and outlet

openings required to obtain the necessary amount of ventilation in naturally ventilated stations depends on the velocity which can be imparted to the flow of air, and this in turn depends largely on the arrangement of station equipment relative to the ventilating openings. Based on observations during test, it would seem that velocities equaling 50 per cent of the theoretical velocity due to chimney action alone can easily be obtained if machines are so arranged that their fan action aids the chimney action in the ejection of heated air from the building.

As the capacity of individual machines increases it becomes necessary to dissipate more heat per cubic foot of building space. For equal capacities, motor-generator sets require more ventilation than converters, due to their lower efficiencies. For relatively large units the outlets may become so large as to occupy the entire roof, resulting in expensive roof construction or costly ventilators or both. In some localities roof ventilators may present objectionable architectural features. In addition the high indoor temperature consistent with natural ventilation may become uncomfortable, particularly in warm climates. It then becomes necessary to collect the heated air as discharged from the machines conducting it outdoors. This can be effectively accomplished by means of collecting housings and ducts.

FORCED VENTILATION

There are conditions more or less special where forced ventilation is the proper solution as:

(a) When continuity of operation is highly important, it has been deemed advisable to install forced ventilation where stations are subjected to protracted durations of dead calm with high outdoor temperature.

(b) In noiseproof stations.

(c) Where air filters, washers, coolers or other known high resistances against air flow are introduced.

(d) In stations located in basements or underground where space is not available for ventilators of sufficient area for natural ventilation.

(e) In particular cases where capital charges and operating costs for forced ventilation are less than that for natural ventilation costs.

Since it is the recirculation of the heated air discharged from the machines that causes a high ambient temperature, it seems logical that the most effective method of ventilation is to collect this heated air and convey it outdoors. This procedure presents an easier problem than that of feeding cooling air at outdoor temperature to the machines. It lends itself more readily to an arrangement in which fans and machines combine their efforts to eject heated air. Fans of lower discharge pressure can thus be used, since the heated air, being confined, can be allowed higher temperature rise and the fan capacity be correspondingly reduced resulting in minimum energy consumption of the motor.

Efficiency curves were given prev

only for 600-volt and 1,500-volt 60-cycle mercury arc rectifiers in comparison with similar synchronous converters.

The inherent characteristics of the rectifier as at present designed are somewhat different from those of the synchronous converter or the motor-generator set. The committee recommended that the A.I.E.E. standard of rating for synchronous converters and motor-generator sets for railway service be applied to mercury arc rectifiers for railway service. It was the opinion of the committee that this method of rating will put the rectifier on the same basis as the rotating machines and will avoid confusion in the minds of operators when making comparative studies of converting machinery. It was recognized, however, that under the suggested standard of rating the rectifier of present design will have a continuous capacity greater than its nominal rating and also that it will be able to carry higher momentary loads than the converter with the same nominal rating.

Questionnaires were sent to 23 owners and operating companies in the United States and Canada, requesting data on characteristics of their rectifiers as experience thus far obtained in operation. Replies were obtained from practically all of these companies.

Automatic operation was reported as fully satisfactory as far as the rectifier itself is concerned. Trouble has been experienced, however, with accessory equipment of various kinds.

The report was signed by C. E. Bennet, C. A. Butcher, H. W. Coddling, A. M. Garrett, H. W. Kidder, Nelson R. Love, H. W. McRobie, Otto Naef, F. W. Peters, W. S. Richhart, G. W. Sathoff, L. J. Turley, R. L. Weber, R. G. Winans, G. I. Wright, W. E. Ryan, chairman; L. D. Bale, sponsor.

Wood Preservation



C. A. Smith

PREVIOUS committees have covered the subject of wood preservation so thoroughly that it remains only to keep specifications and recommendations up to date and in line with those of other organizations, such as the American Wood Preservers' Association and the American Railway Engineering Association.

treating timber in place has been

adopted by the two largest communicating companies as standard practice. As a result of the carefully compiled reports from these companies there is evident a rather widespread interest in securing the longest life possible from the pole timber now in line. While a considerable number of companies adopted such treatments during the past year, these are in no position to add to the information already presented in previous reports. Those interested are urged to obtain the reports which will be issued by a committee on service records of pole timber which was appointed by the American Wood Preservers' Association at its last annual meeting. No further report has been received on the Cobra treatments used abroad and especially in Germany and Austria.

Most of the users of the record form reproduced in last year's *Proceedings* do not keep any record of the treatment or installation, but keep simply a record of the number of ties or other materials installed each year as a starting point, and record is kept of the removal of such treated materials from year to year. When such removals take place, the date of installation is obtained from dating nails put into the material at the time of treatment. Such a practice is very satisfactory where a standard specification has been adopted so that all of the material is handled in the same manner before treatment and the treatment itself is standard.

The committee wished to impress on all users of treated timber the importance of keeping some record of the life obtained on all their particular materials, as it is only by such records that necessary changes in specifications can be intelligently adopted and the actual economy of treated materials can be definitely obtained.

The continued and growing interest in wood preservation as a part of the country's belief in timber conservation supports continued interest in new preservatives or methods. Information on two of the newer preservatives is reported this year. The first, wood preservation with insoluble inorganic salts, is a new development in the form of preservative salts said to remain in the wood without loss due to leaching or weathering influences. It was sought to discover preservative materials which would be as permanent as creosote, low in cost and available in large quantities. The second uses cold treater dust as a wood preservative. Cold treater dust is a smelter byproduct obtained from the Cottrell precipitators of smelting works. The material comes in the form of a finely divided powder. It is composed mainly of arsenic trioxide usually containing about 75 per cent of this substance mixed with compounds of lead, copper, zinc, bismuth, selenium and tellurium.

It was recommended that the committee on wood preservation as an independent committee be abolished, and that a special committee of the Way and Structures Division be appointed to handle the subject in the future. This

special committee should contain representatives from the Power Division, as this group is vitally interested in creosoted poles and crossarms.

The report was signed by J. M. Curtin, T. H. David, J. L. Fritsch, W. H. Fulweiler, Ernest F. Hartman, W. L. Harwood, Leo P. Scanlan, F. H. Swayze, A. P. Way, R. H. White, and C. A. Smith, chairman.

Purchases and Stores



J. Fleming

NO CHANGES in the existing recommendations and miscellaneous methods and practices, as incorporated in the *Engineering Manual*, are recommended.

Owing to the apparent lack of interest in supporting a central exchange for the disposal of unused, inactive material, the large expense involved in its operation and the limited application of the surplus materials offered, the committee recommends against the establishment of such an exchange. Instead, the following procedure is suggested: (1) Endeavor to dispose of materials through company subsidiaries or allied companies, (2) seek permission of the manufacturer to return surplus materials to him for credit or obtain from him a list of other users who might be interested, (3) canvass nearby properties, (4) advertise individually in trade papers or seek an outlet through equipment or second-hand dealers, (5) scrap locally on the recommendation of a storekeeper or a committee duly authorized to act in such matters.

The committee outlined in its report a schedule of routine methods to be departments and suggested it be approved as a recommended method in the *Manual Section*.

The committee believes that a systematic plan for inspecting and testing materials should be adopted by all railways but that such testing and inspection of materials are primarily a problem for the engineering department of individual companies, and that department should decide what methods should be followed and the extent to which standard tests should be applied. It is believed, however, that the stores department is in a position to handle the inspection of a large percentage of

stocks materials which will satisfy the requirements. It is also the duty of the purchasing or stores department to bring to the attention of the engineering or testing department the receipt of materials on which testing instructions have not been received or which should be tested before being accepted.

The following subjects are recommended for consideration by the committee on purchases and stores for the year 1928: (1) Review existing purchases and stores sections of the Manual for revisions and corrections, (2) study the advantages and economics of unit piling and standard packages and recommend a suitable system for use on electric railway properties, (3) study investment in material and supplies and the cost of operating stores, (4) recommend methods and practices for keeping price records and pricing materials and supplies received and issued.

The report was signed by J. Y. Bayliss, A. S. Duncan, A. L. Fischer, B. W. Forkner, F. A. Jordan, P. F. McCall, T. H. McGarry, W. E. Scott, C. Thorburn, W. J. Walker, A. E. Hatton, secretary, A. A. Ordway, vice-chairman, J. Fleming, chairman, and P. V. C. See, sponsor.

Heavy Electric Traction

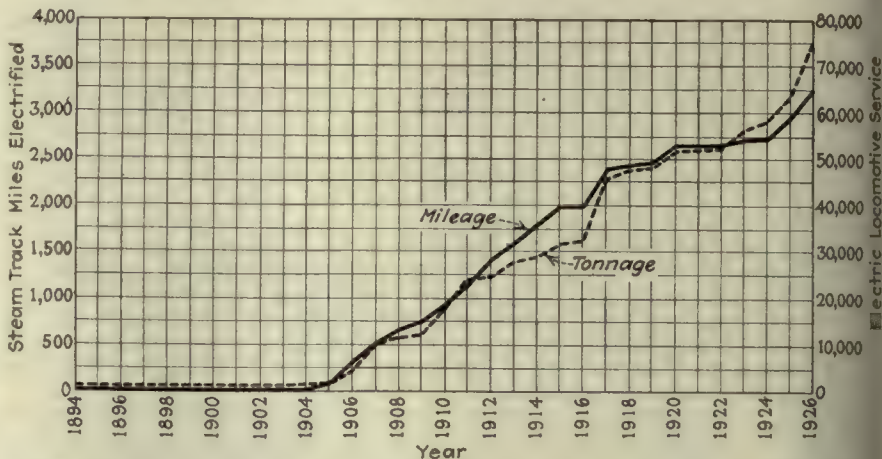


H. F. Brown

SEVEN subjects were assigned to the committee. The study of track and third rail bonds for heavy traction work was continued. It was felt that information on the use of supplementary negatives as an appendix to the tabulation prepared last year of bond practice of electrified steam roads and heavy traction lines will be a valuable addition to the information on track bonding. A questionnaire covering data desired has been prepared.

Information is being collected on the various factors involved in contact resistance. This subject requires some research and the compilation of data not readily available at the present time.

There is no information available as to the extent of reapplying bonds. In some cases pin expanded bonds are reapplied after again milling the terminals and using oversize expansion pins. A number of properties make a practice of removing and reapplying gas-welded bonds. It is recommended that this subject be continued.



Electrified steam railroad mileage and tonnage of electric locomotives, 1894-1926

It was understood that some experiments had been conducted in Europe with the thought that by applying a coating to the rail and joint plate the necessity for rail bonds might be overcome. Nothing of this sort has proved successful. It is possible that more information may be developed on this subject.

Some tests have been conducted to determine the current carrying capacity of the different types of rail bonds. The tests have not been conclusive due to the short sections of rail used conducting heat from one bond to another. The set-ups are hard to make and the problem is further complicated by splice-bar design, bond length and rail sizes. It is recommended that this subject be discontinued.

Information concerning rail joint clearance and its effect on rail bond design was presented, showing several shapes and types of rail bonds serving the same purpose which are made necessary by variation in the design of angle bars.

Drawings of a large number of angle bars have been secured and these will be used in compiling information. It is recommended that this study be continued.

Pursuant to action of the committee, the bibliography of heavy electric traction prepared by the committee was turned over to the New York Library, and its publication has now been authorized. It is hoped that it will appear in the library bulletin early in 1928. Publication will continue serially until the entire bibliography is complete.

Data on branch line electrification and self-propelled cars and locomotives were published in the report, bringing the subject up to date.

Information on articulated trains operated by nine different companies has been obtained, and brought up to date. The data now cover all such units as the committee found were being operated in the United States, Canada and England. No further information, other than named, has been forwarded to date from foreign countries. Articulated train units are now in operation in street car service, subway service and steam road service and have recently been added to high-speed interurban service. The units actually operating

in the heavier services are still comparatively new and limited in number. Further comparative operating data of value are not yet available.

On account of the errors in the tabulation of data on electrification, electrified steam mileage and electric locomotive tonnage on steam roads appearing in last year's report, the committee revised the existing tabulation, retaining the same headings and including new items covering this year's progress. The committee has also brought up to date the chart, which was last published in the 1925 report, showing the growth of steam railroad electrified mileage and electric locomotive tonnage in heavy traction service in the United States and Canada. This chart appears herewith.

The report was signed by A. H. Armstrong, H. W. Cope, A. H. Daus, John C. Davidson, J. H. Davis, J. V. B. Duer, H. H. Febrey, James T. Hamilton, William E. Huber, E. C. Johnson, John O. Madison, M. W. Manz, L. S. Wells, A. H. Woollen, Morris Buck, secretary; J. M. Bosenbury, vice-chairman; H. F. Brown, chairman, and F. H. Miller, sponsor.

Unification of Car Design



H. H. Adams

SINCE the progress report was circulated, following a meeting of the committee held on Jan. 6, there has been considerable development in the subject of car and equipment design. Interest is increasing and considerable experi-

mentation is under way. The committee believes that its function at the present time should be that of following closely the development and directing thought along these lines, rather than preparing a more elaborate report.

The report was signed by J. A. Brooks, C. A. Burleson, W. J. Clardy, L. J. Davis, C. Gordon, J. W. Hulme, G. L. Kippenberger, J. Lindall, V. Wiloughby, A. L. Kasemeier, A. P. Jenks and H. H. Adams, chairman.

Way and Structures Division

THE committee held three meetings during the year with chairmen of special committees present for the purpose of discussing their assignments and giving them the benefit of such suggestions as the standard committee might make. This policy was a change from that which was followed the preceding year, when no meetings were held, and it is believed that the results obtained under the new plan were much more satisfactory.

In the case of special committee No. 2, the way and structures committee approved the following specific recommendations, involving revision of existing Manual sections:

(a) Revision of W-108-23 to agree with A.E.R.A. specification regarding countersinking of rivets.

(b) Revision of clause 402-B in W. 105, 106, 107, 108 and 109-23 changing depth of flangeways.

(c) Revision of clause 403, same Manual sections as above, covering depth of groove.

(d) Addition of a new paragraph to clause 403 in above specifications covering the matter of continuous flange bearing.

The standing committee voted to amend clause 401-b-4, Manual section W. 1-25, to read: "No variation will be allowed in dimensions affecting the fit of the splice bars except that the fishing template approved by the purchaser may stand out not to exceed $\frac{1}{4}$ in. laterally."

The experiment in reorganizing the Engineering Association with a group standing committee supervising the special committees in its own division and passing upon standards submitted was first tried out in the way and structures division during the year 1925-1926. It was but natural that the first year's operation under the new plan was not all that might have been desired. Profiting by the first year's experience, some modifications in the procedure followed were made during the past year's operation, with decidedly beneficial results. It is the opinion of the committee, as the result of two years' experience with the new method of handling the work in its division, that it would be well to definitely fix the procedure to be followed in taking letter ballots so as to standardize this for all standing committees. It is recommended that clause 505-d of the regulations governing committees be revised to read: "Before any recommendation of a special committee shall be placed before the association for adoption, it shall be approved by letter ballot by at least a two-thirds vote of

the standing committee of the division in charge. Such letter ballot shall be taken in the following manner: In sending out a report for ballot, two weeks shall be allowed from the date of transmittal within which all members of the standing committee must submit their initial ballot to the chairman, with a copy to every other member of the standing committee. A further period of ten days shall then be allotted for submitting a final ballot, thus giving an opportunity for every member to reverse his original decision should he so desire. Furthermore, if any recommendation of a special committee involves more than one division (as may occasionally be the case) approval must be similarly obtained from the other interested divisions."

It is the opinion of the committee that if such procedure is adopted there will not only be a uniformity on the part of all standing committees in taking such letter ballots, but there will also result a more intelligent ballot in each case, as there will be presented a definite opportunity to reverse an original ballot in the light of such opinions as may be expressed by the other members of the committee in their original ballots.

The report was signed by C. A. Alden, E. B. Entwisle, W. G. Hulbert, E. J. McIlraith, J. R. McKay, H. F. Merker, C. A. Smith, A. T. Spencer, H. M. Steward, W. W. Wysor, E. M. T. Ryder, vice-chairman; H. H. George, chairman.

Alloy Steels Other than Manganese in Special Trackwork

FOR a number of years manganese steel has been regarded by the industry as an approved product for use in special trackwork. Production is economical, fabrication is easy and a uniform product is secured. A number of roads have had quite unsatisfactory experiences in attempting to build up and repair manganese steel in special trackwork and considerable controversy has taken and is still taking place over the possibilities of making uniformly satisfactory repairs to this class of steel. This, together with a desire to secure a material which could easily be machined in a track shop, has evidently resulted in a search to secure, if possible, a substitute.

A number of manufacturers have intimated to the committee that they are ready and willing to adopt a new alloy steel for use in special trackwork, provided it can be manufactured as economically as manganese steel and in

such tonnage as would justify the training and organization of crews. Being familiar with the qualities of chrome nickel steel as applied in directions other than for trackwork and with a knowledge of its sensitiveness in handling during manufacture and the difficulty in securing a uniform product, they advise that it should supersede manganese steel only after it has proved itself more serviceable and to present a higher resistance to shock and abrasion under service.

The committee, therefore, decided to proceed with investigations to cover the following points.

(a) Comparative prices of alloy steels in special trackwork layouts.

(b) Road tests or experience under service with alloy steel layouts already installed including the securing of records and comparative wear of manganese and other alloy steels in existing layouts and on test pieces and layouts to be installed during the current year.

(c) Practical tests of comparative superiority of weldability of manganese and other steels and a study of records from the use of various kinds of welding rods.

(d) Laboratory tests on welded section of alloy steels.

In general, manufacturers have produced only chrome nickel special trackwork in substitution for manganese steel and the cost to manufacture has been somewhat higher than the standard manganese steel product. Layouts, however, have been furnished to the industry for test purposes at about the same price as quoted for manganese steel.

The committee has, through the courtesy of manufacturers and the cooperation of users, been able to secure information as to location, date and conditions of installation, and some wear data on practically all of the special trackwork pieces and layouts which have been fabricated in alloy steels, other than manganese, and which have been installed in the United States and Canada up to the date of this report. With the exception of some recent experiments with chrome molybdenum steel, all layouts furnished in other than manganese steel were manufactured of chrome nickel steel. Nearly all of the layouts, records of which have been secured by the committee, have been manufactured to specification, an abstract of which is as follows:

Chemical Analysis:		Per Cent
Carbon.....	0.45 to 0.55	
Manganese.....	0.60 to 0.80	
Phosphorous.....	Not over 0.05	
Sulphur.....	Not over 0.05	
Silicon.....	Not over 0.40	
Chromium.....	Not less than 0.80	
Nickel.....	Not less than 2.75	
Physical Qualities		Not Less Than
Elastic limit, pounds per square inch.....		60,000
Ultimate tensile strength, pounds per square inch.....		100,000
Elongation in 2 in., per cent.....		12
Reduction of area, per cent.....		17
Minimum Brinell hardness.....		200
Minimum thickness of flange, inches.....		1 1/2
Minimum thickness of throatways, inches.....		1
Minimum thickness of base at outer edge, inches.....		1
Minimum thickness of base at web, inches.....		1

Committee Chairmen, Way and Structures Division



1. S. C. Baker 2. W. R. Dunham, Jr.
3. H. H. George 4. C. H. Clark
5. H. E. Bachman

6. A. T. Spencer 7. E. M. T. Ryder
8. C. F. Gailor 9. W. W. Wysor
10. A. E. Harvey

The committee understands that chrome nickel test pieces, including some of the earlier installations, noted below as having failed, were manufactured with a chromium percentage of 0.50 and a nickel percentage of 1.25, but dynamic and endurance tests have indicated that the higher chromium and nickel, as noted above, makes the steel more resistant to shock.

Information secured as the result of a questionnaire is somewhat conflicting. The committee has arranged to have five special trackwork manufacturers make up as requested a number of pieces of manganese steel and of chrome nickel steel for welding tests. It has also arranged to have these welding tests made by experienced welders on five electric railway properties.

The committee believes that the possibilities from the use of alloy steels other than manganese in special trackwork are such that the question should receive further consideration than it has been able to give. It therefore recommends (1) That observations should be continued on installations of chrome nickel steel in special trackwork; (2) that the experiments suggested be carried to a conclusion.

The report was signed by R. B. Fehr, F. G. Hibbard, E. F. Kenney, P. A. Kerwin, B. P. Lagaré, R. H. Noderer, O. C. Reyfuss, F. B. Walker and A. T. Spencer, chairman.

Tongue Switch and Hard Center Plates

COMPLETE detail drawings are submitted for a "100-ft." solid manganese switch, showing the general plan, the plan of heel, sections at heel and pin-holding device. Full-size iron

models of the switch tongue heel were made to aid in studying its practical action.

The type of heel and heel-fastening device is novel in several particulars, but is believed to be thoroughly sound and to present several marked advantages. The heel or pin is of the tadpole type of 9½-in. diameter and is carried down to a bed on the base of the 7-in. casting. This provides a vertical wall of large dimensions which resists any forward motion of the tongue under trailing traffic. The distributed wear on this wall will be very slight, even if the holding device is not kept in operative condition, so that the joint between heel of tongue and casting should not increase materially during the life of the switch.

The supporting area under the heel is as large as in any previous design and is located with special effectiveness, as the extreme rear portion has a bearing directly at its edge, as the recess under the casting back of the pin makes it possible to grind the bed true at this point.

The fastening device holds down and back as well. It consists of a lever held in place by a bolt which is readily accessible. The lever makes contact with the heel on an inside diaphragm at the center of revolution, thus providing rolling motion instead of frictional wear. The diaphragm also stiffens up the floor of the heel. Drawings of this switch

were published in *ELECTRIC RAILWAY JOURNAL*, Sept. 24.

In the study of hard center plates the committee decided not to take up the question of methods of fastening the plates down to the castings, but to consider the surface areas required to take care of tread widths, proper supporting pressures, etc.; also to consider the possibility of selecting a limited number of sizes, each size to serve between given limits of frog angles; also to consider plate thickness, depth of groove taper of inclines, etc. The committee has agreed on the limits, dimensions, etc., referred to above and they are shown on a drawing submitted.

The committee recommends:

1. Approval of tongue switch design as "recommended design."
2. Continuance of subject with instructions to prepare designs for road other than 100 ft.
3. Approval of center plate dimensions as "recommended design."
4. Discontinuance of subject.

The report was signed by C. Alden*, J. U. Bragg, E. B. Entwistle, R. B. Fisher*, H. F. Heyl, William Hulbert, M. M. Johnston, D. R. Pay, G. A. Peabody*, E. P. Roundey, W. Wysor* and E. M. T. Ryder, chairman.

Track Ballast and Drainage

AT THE beginning of its study was the opinion of the committee that previous reports could be reviewed and brought up to date. It was found, however, that all phases of the subjects under consideration were covered and that standard practice with reference to ballast, rail, etc., had been changed on a number of properties.

*With reservations.

A mechanical operating device, such as a push button regulating the opening and closing of doors electrically, gives the greatest satisfaction and the best results. Such a control makes possible the stopping of the door at any point in its travel. A push button control which must be held in during the time the door is opening or closing gives the greatest measure of safety. The control should be conveniently located, preferably inside under an operator's care and charge. The control should automatically stop the opening or closing if the door meets an obstruction in its travel.

Where all wood doors, of sliding, swing or accordion type are used one of the leaves should not exceed 6 ft. in width. This may be increased to 10 ft. if substantial steel framing is used.

All metal doors are more expensive and require more substantial supports than do other types. They are also more difficult to repair when damaged. Such doors, however, when properly installed, give better satisfaction and results because they stay in shape.

The committee believes that, generally, best results are obtained by using some form of horizontal sliding door with suitable guide rigging at the top and supported and operated on adequate wheels and track at the floor. The floor guide should be slightly rounded and above the floor rather than a groove. The wheels should be flanged to operate over the guide.

The committee included a drawing of a bus washing machine used in Edinburgh, Scotland. It also presented plans of two garage layouts. One was of 20,000 sq. ft. for 56 buses, the other was of the Frankford bus garage of the Philadelphia Rapid Transit Company with ultimate capacity for 214 buses.

The washing machine can be used for all vehicles from a small two-seater car to a 52-seater double-deck omnibus. It covers approximately 495 sq. ft. of floor space. The extreme outside length is 29 ft. and the width between inside of island curbs is 7 ft. 9 in. These islands serve as the foundation for the frame of the machine. Rounded at the ends they contain a trough, 18 in. wide by 6 in. deep, which extends the whole length of each island.

The two center pipes on each side, are movable and, being coupled together, are actuated by lever handles. This arrangement permits of the lowering and raising of the spray of water as required.

The number of men required to operate the machine is three, one at either side to manipulate the spray handles, and the third at the front end to wash the bonnet and front part of the body. The time occupied in washing a bus is four minutes, as compared with twenty minutes under the old method, and the quantity of water used per bus has been reduced from 150 gal. to 100 gal. each. The water pressure is approximately 100 lb. per square inch. [Further particulars of this machine will be published in a later issue of this paper.—Ed.]

Pressure systems are, in part, or wholly, more or less widely used. Such systems are not altogether suitable for

body washing. They do a very good job on the washing of parts under the bus body, trucks, etc., but frequently damage the body paint.

Some companies are experimenting with substances producing a dry wash applied in solution form much as a polish, but the committee does not yet have authentic data to show the results obtained.

The report was signed by A. J. Blackburn, G. H. Haldeman, A. Hughes, Jr., L. F. Parlette, W. W. Wise, and J. R. McKay, chairman.

Effect of Rubber-Tired Vehicles on Pavement

QUESTIONNAIRES were sent to representative member companies throughout the country and replies received from practically all, containing a variety of opinions, all of which, however, tended along the same general line and to the conclusions which were finally arrived at by the committee.

In reply to the question as to whether there was an increase in the number of failures of street pavement within the railroad areas which are attributable to the increased use of heavy rubber-tired vehicles, a number of member companies reported there had been no noticeable increase. The majority, however, reported there was an increase in the number of paving failures due to this cause, in some cases to the wearing surface, but in general the failures could be traced directly to the fact that the paving foundation was too light for the heavy vehicular traffic of the present day. It appears that there is no increased wear to the paving surface on account of the use of rubber-tired vehicles carrying ordinary loads.

Inquiry as to the types of pavement now used brought a variety of answers showing the tendency in heavy traffic areas to continue the use of granite block and brick paving, wearing surfaces which are the least affected by the increased wheel loads. Concrete paving is coming into more general use, as it provides a smooth riding surface and has the advantage of combining the wearing surface and base into one solid slab. Asphalt paving is being used by a number of street railways and is giving satisfactory service. Creosoted wood block paving has shown the greatest relative wear under heavy vehicular traffic loads and many companies have discontinued its use.

In general there is a decided tendency to adhere to the usual wearing surfaces, with the exception of creosoted block, and to increase the depth or strengthen the paving foundation, in some cases by introducing reinforcing in the slab, as all companies have conceded the fact that the life of the pavement depends largely on the foundation.

Regarding the cross-sectional contour of the top surface of paving in track area, it was formerly the practice in many cities to crown the pavement between the rails and in the case of T-rail track to lay the paving on the gage side

to meet the underside of the head of the rail. The majority of the companies have found that the best results may be obtained by laying the paving in a plane surface, level with the tops of the rails, thereby eliminating the impact from heavy wheel loads, which is injurious to the pavement and track structure, especially at street intersections.

The use of rubber tires has introduced a hazard in operation over asphalt pavements, on account of skidding, which did not exist with the use of steel tires, and this feature is receiving consideration in some localities, with a tendency to use surfaces which have a better holding effect upon the tires.

The conclusions of the committee are that damage is being done to track pavement due to the use of rubber-tired vehicles which permit excessive concentrated loads and further that such vehicles generally travel at high rate of speed, with abrupt acceleration and stops, all of which has a detrimental effect on the pavement.

The committee recommends that in cities where paving failures occur in the track area a request be made to the proper city or state authorities to check up on the loading of trucks, buses and other vehicles above the maximum weight permissible for various types of trucks, etc.

The report was signed by N. R. Alexander, C. W. Burke, W. G. Matthews, W. L. Wilson and A. E. Harvey, chairman.

Track Construction

In Co-operation with A.S.M.I.

DURING the year 1923 specifications for street railway track construction prepared jointly by a committee of the American Electric Railway Engineering Association and a committee of the American Society for Municipal Improvements was approved by the A.E.R.E.A. and published in the Manual as a "Recommended Specification." These specifications were adopted by the A.S.M.I. by letter ballot in 1924. During the year 1925, however, certain drastic changes in these specifications were recommended by certain members of the committee on street railway pavements and track construction of the A.S.M.I. and these changes were embodied in a report submitted by these members to the convention of the A.S.M.I. in October, 1925. A representative of the A.E.R.E.A. appeared at this convention and requested that the suggested modifications be given further consideration and if alterations were found advisable such changes should be passed on by a joint committee of the A.S.M.I. and A.E.R.E.A. before submission to A.S.M.I. for approval. This suggestion was adopted and the matter was referred to a new committee.

Since the reference of the matter to the new A.S.M.I. committee various suggestions were made by the members of the A.E.R.E.A. committee and it was clearly shown that the proposed changes were not warranted. The A.S.M.I. com-

tee, after careful consideration, did not deem it wise to recommend any changes in the present specifications. It was thought that it would be well to allow these specifications to stand for a few years or until a real need for their revision is shown. In the meantime this committee will consider carefully all matters pertaining to tracks submitted to it. If complaints should be made by members of the A.S.M.I. that certain details of track construction work are not satisfactory the committee, working in conjunction with the committee of the A.E.R.E.A., will furnish the complainant information as to the locality where similar types of construction are in successful use, and with this information complainants can determine for themselves the reason for the troubles. If, for any reason, the committee is unable to give locations where the type of construction under criticism is in successful use, modifications of the specifications might prove advisable. The report of the A.S.M.I. committee was adopted. Apparently there will be no attempt made this year to change the specifications for street railway pavements and track construction by the A.S.M.I. The A.E.R.E.A. committee recommends that the subject be assigned to an ensuing committee with instructions to co-operate with the A.S.M.I. in matters pertaining to specifications for street railway pavements and track construction.

The report was signed by W. R. Dunham, Jr., Howard H. George, E. M. T. Wyder, W. W. Wysor and C. L. Hawkins, chairman.

Rail Corrugation

DURING the current year the committee has continued its accumulation of data from test sections of track. The co-operating companies are so widely distributed geographically that the track sections now under observation permit the accumulation of data for a wide range of climatic, construction and operating conditions. The data accumulated so far have not been analyzed and digested in detail, as it is desired to secure data covering a longer time before attempting a detail study.

Last autumn at the Barcelona meeting of the International Association of Tramways, Urban and Interurban Railways and Public Autobus Transportation a sub-committee of the international committee on standardization of rails and track equipment presented a valuable and rather extensive report on the subject of rail corrugation, or as they call it in continental Europe, "undulatory wear of rails." There appears to be a rather general agreement between the tentative findings of the foreign committee and those of your committee.

From the mitigation standpoint the foreign committee seems to be centering its attack on the problem of improving rail quality. It believes that corrugation is caused by frictional wear and periodic impact blows, and there-

fore to resist corrugation the rail should be capable of resisting both frictional wear and crushing. These requirements call for a rail metal which has a high elastic limit in order to withstand impact blows without permanent deformation and a high work of rupture in order to withstand the tearing off of particles, or abrasion. The work of rupture is measured by the area under the stress-strain diagrams obtained in a tensile strength test:

In making physical tests on test specimens cut from corrugated and non-corrugated rails the foreign committee found that for each specimen of corrugated rail the work of rupture was relatively low and for the non-corrugated rails relatively high. The idea of work of rupture as an item in the specifications for rail steel seems to be a new and important one from the standpoint of mitigating corrugation.

Foreign test data, analyses of data collected by this committee on its inspection trip in 1925, results of studies of hardness of rail surface, physical characteristics of corrugations and vibration of track and equipment are presented in a series of appendices.

As a result of its study of the various data and information presented with this report the committee makes the following tentative suggestions relative to corrugation mitigation:

1. Increase the contact area between the wheel and the rail. This will reduce the localized stresses which produce cold working and abrasion.

(a) Select wheel and rail contours such as will give maximum area of contact.

(b) Tilt the rails so that the heads are inclined inward slightly.

(c) Use wider wheel treads and larger diameter wheels.

2. Minimize car nosing.

(a) Keeping a proper relation between wheel and track gages.

(b) The use of properly shaped wheel and rail contours.

(c) The use of longer wheel bases.

(d) Keeping the "play" out of bearings.

(e) The use of longer cars or cars with a greater distance between truck centers.

3. Minimize vibration and impact loads.

(a) Better track and rolling stock maintenance.

(b) Minimizing the unsprung weight.

(c) Minimizing wheel vibration.

4. Minimize wheel slippage.

(a) Maintain equal diameters of wheels rigidly fastened to the same axle.

(b) Use independently coupled wheels and in case of trailers, loose wheels.

(c) Minimize car nosing.

(d) Use wheels with properly shaped contours.

(e) Avoid extra tight or extra loose track gage.

5. Improve the surface of the rail head.

(a) Accepting only straight rails from the mills.

(b) Keeping the tracks free from sand, gravel and other street debris.

(c) Grind the rolling surface smooth before putting the track into operation.

(d) So constructing the track that the rail heads will be slightly above the paving level.

The committee realized that many of these suggestions are impractical in specific cases. The apparent and immediate causes of corrugation as far as they may be determined by the data now in hand are the cold working and abrasion of the rail head surface caused by the irregularity of the rolling of the wheels and by the vibration of the rails and rolling stock, imposing excessive loads on small areas of the rail surface.

As to the removal of corrugation, the best information in the possession of the committee seems to be that the corrugations should be ground out as soon as they appear and that the grinding should be so done as to maintain a maximum area of continuous wheel-rail contact and to maintain this area centered within the "middle third" of the rail head.

The committee believes that the collection of data from the test sections of track now under observation should be continued and that some experimental sections of track should be installed with the end in view of determining a type of track construction which will better resist corrugation than do existing types. It also believes that the vibration studies should be continued and that certain physical laboratory tests should be made on specimens from corrugated and non-corrugated used rails.

The report was signed by C. H. Clark, E. B. Entwisle, D. D. Ewing, secretary, R. B. Fehr, H. Fort Flowers, C. R. Kinnear, T. J. Lavan, E. L. Lockman, A. M. Nardini, J. Ormondroyd, H. Jackson Tippet, Claude L. Van Auker, H. S. Williams, vice-chairman, and W. W. Wysor, chairman.

Rails

RELATIVE advantages of 7-in. rail and 9-in. rail are outlined in the report of the committee, but no attempt has been made to prescribe the use of either type. After considering the varied conditions under which 7-in. rails have been selected, the committee finds them to have the following advantages:

1. This rail, on account of its lesser depth, requires less excavating and in most instances requires less material to be installed in the way of foundation and structure.

2. For a specified weight per yard a 7-in. rail with a proper distribution of metal would afford considerably greater lateral stiffness on account of the base and head being heavier. Similarly, the 7-in. association standard rail compared with the heavier 9-in. association standard rail has almost the same moment of inertia about a vertical axis in spite of its lesser weight. Lateral stiffness of a tangent rail in track is very helpful in maintaining pavement, while at the same time, it reduces the need for tie rods. When paved with granite, the 7-in. rail requires less reinforcement

from the tie rods than does the 9-in. rail. When asphalt pavement is used, many railway companies are, on account of the concrete going to within 3 in. of the top of the rail, no longer using tie rods.

3. If rails are to be welded in tracks, the cost of the welding in many of the modern methods is cheaper for a 7-in. than for a 9-in. rail. While it might be argued that the weld in the 9-in. rail will give greater strength than the weld in the 7-in. rail, it is nevertheless true that as a general thing the weld on the 7-in. rail has more than sufficient strength for its purpose.

4. When repairs are necessary, a 7-in. rail affords cheaper maintenance, because less paving material must be broken away and later restored. Where there is a concrete base for asphalt pavement, this is a considerable item.

5. Seven-inch rail requires about 10 per cent less tonnage per unit length of track. If the 9-in. rail offered sufficient advantage, this question might be ignored, as the added cost might be justified, but other things being equal this item is considerable.

6. The drilling in the 7-in. rail lies more nearly along the neutral axis than in the 9-in. rail and for that reason weakens the rail less. This may seem of little consequence, but breaks through bolt holes are not unusual.

7. For such companies as have occasion to bend rail, the 7-in. rail affords greater economy on account of greater ease in bending. While the moment of inertia of the section about a vertical axis is not so much greater in a 9-in. rail than in a 7-in. rail, that about the horizontal axis is very much greater in the 9-in. rail, and this would add largely to the cost of rail bending because of the vertical set required in connection with lateral bending. Those who do not bend their own rail would therefore expect to pay more for curved rail if it were 9-in. instead of 7-in.

8. The matter of transporting rails from supply yards to the job would show considerable advantage in favor of the 7-in. rail, as to both cost and convenience of handling on account of the greater ease of loading and handling with the consequent less likelihood of accidents to men.

Advantages of 9-in. rail are:

1. While a 9-in. rail requires a deeper splice bar and more bolts than does a 7-in. rail, it nevertheless provides a stronger joint. This is important in tangent track, but is more so in special trackwork, where a similar advantage is attained when cast-in arms are used. There is no doubt that a 9-in. rail cast-in is firmer and less likely to loosen than would be a 7-in. rail. The internal joints being stronger than with a 7-in. rail, there is a further advantage tending to prevent looseness of arms. This reason has been very largely recognized by many railway companies that are using 7-in. rail for tangent track cling to 9-in. rail for use in special trackwork because of extra strength thus procured.

2. Because of the greater beam strength of the 9-in. rail there is a

better distribution of load over the supporting soil, which permits less deflection and therefore less disruption of foundation. It is not uncommon to find two pieces of track built under practically identical conditions on the same character of soil and with practically the same traffic, where the 9-in. rail stands up firmly for a great deal longer period than does the 7-in. rail. This result is due to the lesser deflection of the 9-in. rail. In the larger cities where there is greater congestion of traffic and where there is also more burrowing into the street, the additional strength of the 9-in. rail is a considerable advantage, not only because it is easier and safer to take care of while construction work is going on underneath such as sewer, conduit, water pipes and gas main work, but because after the work has been finished and restored in such manner as such work is usually restored, the 9-in. rail offers a far better support to the load than does the 7-in. because usually the excavations are not properly back filled and at the point where the excavation has been made there is often no support at all and the rail must serve as a bridge as well as a rail. Therefore when it is found desirable on account of soil, pavement, traffic or

other conditions to use a stronger rail the additional height and weight of the 9-in. rail may be well worth the additional expense.

3. Where certain kinds of pavement are concerned, the 9-in. rail offers better facilities than does the 7-in. If a 5-in. granite block is used with a 1-in. cushion of sand, there would be with a 7-in. rail only 1 in. of concrete over the tie and this 1 in. of concrete is practically useless, as it offers but very little help in bridging the space between ties. A heavy load applied between the ties often forces the concrete through, the 1 in. concrete over the ties shearing off, if it has not already become cracked and loose from shrinkage. If the granite used is of 8-in. type, obviously a 7-in. rail would not offer sufficient space for the installation.

In conclusion it is recommended that this committee be discharged and the subject discontinued for the present and until such time as there shall arise some new reason for giving it further consideration.

The report was signed by J. U. Bragg, G. H. Haldeman, R. M. Hannaford, E. S. Myers, John F. Rodgers, Oscar Williams, and H. F. Merker, chairman.

Rolling Stock Division

FOLLOWING are the subjects referred to special committees. The chairman of each special committee has met with the standing committee on rolling stock so that the reports have the advantage of joint advice and help.

Committee No. 1, Manual Review—The report has been submitted to the standing committee on rolling stock and approved by it by letter ballot and has been referred to the Executive Committee.

Committee No. 2, Motor Coaches—The report has been submitted to the standing committee on rolling stock and approved by it by letter ballot and has been referred to the executive committee.

Committee No. 3, Study of Car Equipment with Reference to Appearance, etc.—This report has been submitted to the standing committee on rolling stock and approved by it by letter ballot, and has been referred to the executive committee, which, with the elimination of the last paragraph approved same and recommended it to be published for distribution in advance and presented on the floor of the convention.

Committee No. 4, Car Lighting—This report has been completed and submitted to the standing committee, which has approved same by letter ballot. It has in turn been submitted to the executive committee, which voted to approve the report for advance publication and for submission to the membership for letter ballot on those parts recommended to be included in the Manual. The report will also be pre-

sented on the floor of the convention.

Committee No. 5, Study Results of Roller Bearings for Trucks—Progress report will be presented at the Convention.

Committee No. 6, Lubrication—This report has been submitted to the standing committee on rolling stock and approved by it by letter ballot. It has been submitted to the executive committee for its action.

Committee No. 7, Suction Strainers—This report has been submitted to the standing committee on rolling stock and approved by it by letter ballot. It has been submitted to the executive committee which has approved it and recommended its presentation on the convention floor.

Committee No. 8, Side Wear Carbon Brushes—This report has been submitted to the standing committee and approved by it by letter ballot.

Committee No. 9, Noise Reduction—The report has been submitted to the standing committee and approved by letter ballot.

Committee No. 10, Gears—This report has been completed and submitted to the standing committee on rolling stock which has approved same by letter ballot. It has been submitted to the executive committee which has also approved it and recommended its presentation on the convention floor.

Committee No. 11, Current-Collecting Devices—This report has been completed and submitted to the standing committee on rolling stock, which has approved it by letter ballot. It has also been presented to the executive committee.

which has approved it and recommended its presentation on the convention floor.

Committee No. 12, Journal Boxes—This report has been completed and has been submitted to the standing committee on rolling stock, which has approved it by letter ballot. It has also been submitted to the executive committee for its action.

Committee No. 13, Limits of Wear—The report has been submitted to the standing committee and approved by it by letter ballot.

The report was signed by J. A. Books, W. W. Brown, M. R. Hanna, J. M. Hipple, J. S. McWhirter, A. D. Whorter, T. H. Nicholl, R. B. Syth, W. G. Stuck, H. S. Williams, A. T. Clark, chairman, and R. S. Bull, vice-chairman.

Review of Equipment Section of the Manual

EXISTING standards and specifications referring to equipment, which are included in the 1926 issue of the Manual, were reviewed, and the following revisions and additions recommended:

E 1-26—Design of Brake Shoes, Hubs, Keys, and Gages. To provide additional clearance in the flange groove of brake shoes, dimensions of the shoes were changed. To reduce the number of drawings in the Manual, the six standard shoes, together with hubs and keys, were presented on three drawings.

E 4-23—Dimensions for Height of Platforms and Bumpers for Interurban Cars. The committee decided that standard height of platforms for interurban cars was not needed, so the paragraph on this subject was withdrawn. Also the paragraph on standard height of bumpers, which previously was specified as 43 in., was changed to read: "The standard height of bumpers for interurban cars measured from the top of the rail to the bottom of the bumper should not exceed 43 in."

E 14-25—Dimensions of A.E.R.E.A. Steel Wheels. To prevent misunderstanding, the following paragraph was added: "The hub diameters given in the tables of steel wheel designs should be looked upon merely as maximum limits to take care of eccentric bores. In the inspection and acceptance of wheels, the specification E 7-21 should govern in all cases, and wheels accepted or rejected on hub-wall thickness within the tolerances given in the specification."

The committee recommended the following addition to the tables in order to provide for bolting on pads to reduce noise in operation: "Four holes should be included in standard wheel designs for electric railway service in order to provide for the bolting on of pads to reduce noise in operation. When specified, these holes should be at least 1 in. in diameter and should be located on a radius approximately 2 in. from the inside diameter of the rim."

E 100-12—Automatic Couplers for Interurban Cars and Radial Draft Rigging. To obtain information regarding

Committee Chairmen, Rolling Stock Division



1. F. J. Foote
2. A. T. Clark
3. W. S. Adams
4. Hugh Savage
5. R. W. Cost



6. J. C. McCune
7. W. G. Stuck
8. C. W. Squier
9. V. W. Berry
10. R. A. Hutchins

the number and different types of couplers now in service, a questionnaire was sent to all electric interurban roads. Replies from approximately 125 were received and tabulated. They relate particularly to the location and installation of couplers on cars.

It was recommended that a special committee be appointed to consider this subject and that the present specifications be withdrawn.

E 101-12—Specification for the Location of End Connections on Interurban Cars Used in Car Exchange Service. The drawing showing location of end connections was revised, and a new one submitted with revised dimensions.

E 216-26—Motor Leads. To give more information regarding the recommended practice in insulating connectors of motor leads the following paragraph was added: "They may be insulated by slipping on a piece of rubber hose with ends taped to keep out water, or a method of insulation may be used, as

shown in Fig. 5." A new drawing was submitted and included as Fig. 5.

In reviewing the various standards and specifications now included in the Manual the committee found a large number which have been taken from other associations. Revision of such specifications is very difficult. To lessen the trouble the committee recommended that when it is found desirable to adopt standards, specifications or recommend practices of other associations, committees of the Rolling Stock Division make no attempt to reproduce the full standard, but that some form of reference be used in the Manual calling attention to the specifications, standards or recommended practices, giving a brief summary as to what they include and information as to how copies of the standards may be obtained.

The report was signed by Walter S. Adams, Thomas H. Nicholl, H. S. Williams and Clarence W. Squier, chairman.

Motor Coaches

SUBJECTS assigned to this committee are:

1. Study motor coach design and consider motor coach standardization.
2. Investigate maintenance methods and inspection schedules in motor coach operation.

The study made by the committee discloses action on the part of several organizations, including the Society of Automotive Engineers and also state regulatory bodies, in the matter of adopting standard specifications for motor coaches.

There appears to be a lack of uniformity in prescribed motor coach specifications and regulations by state regulatory authorities, which is attributed to independent thought and action on the part of these bodies. In addition motor coach specifications recognized by organizations representing the industry show a similar lack of uniformity. This points to the necessity of standardization in fundamental and controlling factors, such as over-all length, width, rear and overhang, width of doors, the location of rear-end emergency doors, etc.

While the committee is of the opinion that uniformity in design with reference to certain dimensions is important and if not carried out might seriously hamper interstate operation, the rapid development of the industry makes it appear inadvisable at this time for this committee to recommend definite standards of design and construction. To do so might curb initiative on the part of manufacturers and limit the range of specifications on the part of operators in the procurement of equipment for their needs.

The committee has reviewed the work of last year's committee and indorses the philosophy of inspection on a mileage basis. This enables maintenance to be carried out on a unit basis, results in minimum time consumed for repairs and aims to avoid road difficulties.

The advent of the gas-electric motor coach has brought about the development of an inspection and maintenance schedule applicable for this type which your committee believes will be of general interest. The schedule, which is included in the report as Appendix A, is employed by a large operator of gas-electric motor coaches.

The committee recommends:

1. That the subject of motor coach design and standardization be continued and that the committee continue the work in conjunction with standards committee of the Motor Coach Division of the Society of Automotive Engineers.
2. That the committee also consider the matter of bus design from the standpoint of unit construction and accessibility to wearing parts, which is of vital importance to economical maintenance.
3. That the committee continue the subject of maintenance methods and inspection schedules and consider prescribed standards covering limits of wear of parts as a means of efficient and economical maintenance.

The report was signed by H. L. Derbink, W. H. Downey, H. C. Eddy, F. A. Klock, L. H. Palmer, A. J. Scaife, C. W. Stocks, and V. W. Berry, chairman.

Car Equipment

IN LAST year's report this committee suggested a means of bettering the external appearance of a single-end car. Recently a car has been rebuilt to embody these recommendations. New features are a tapering of the front end to give a pointed appearance and the addition of a visor over the front windows, which not only helps accentuate this but also provides a very practical means of preventing glare in the motorman's eyes.

There is a distinct trend away from the old-style slat-covered floor. In addition to the linoleum, rubber and similar types of floor covering, attention is called to composition floorings which are applied in a plastic state with a trowel. Such a type of flooring lends itself readily to the addition of cove edging, with consequent easier sweeping of corners. Such a floor may be flushed with hose and water without fear of damage to the body or equipment. Stream-line painting is very much in vogue at the present time and it is contended that its application to cars will do much to improve their appearance from an artistic standpoint as well as giving them a modish, up-to-date air. To give cars a long, low, speedy appearance the sides of the car should be broken up into two or more bands, instead of having one solid color.

A second principle which produces a long, low appearance is the avoidance of vertical lines and bands, particularly of a dark color.

A third principle is to create tapered ends, and in the case of a single-ended car to make the front end of the car look as if it were intended to be the front end of something instead of a duplicate of the rear end. While this is largely a function of the design of the car, yet this principle is bound up inextricably with the theory of stream-line painting. There is one line on the front end of a car to which little attention has been paid from the artistic viewpoint, yet its importance should be stressed. This line is the gutter over the front door. If this slopes downward toward the front, a pointed, pleasing front results, while if it slopes downward toward the rear, a much less favorable impression is produced.

The adoption of a strictly high-grade seat is recommended for both city and interurban service. The meaning of the term "high-grade seat" is intended to include a seat of the deep upholstered type with a spring or yielding back. It is recommended that the maximum height of the cushion be 17½ in. above the floor.

There is a marked trend toward individuality in seat design—that is, to make double seats resemble two seats. An example of this is the bucket type seat. Modifications of this appear in

the usual type of seat back, but with two convex curves to give the appearance of separate backs and a division of some sort between the two halves of the cushion.

Due to the difficulty in adapting the higher grade seats to double end operation and the consequent necessity for a reversible type, attention is called to a swivel operation. This allows the seat to be rotated and accomplishes the same result as the reversible seat.

It is recommended that in the selection of seat covering attention be given to the adoption of material that in texture and color will convey the impression to the public of being up to date. A black leather or imitation leather is therefore less desirable than the newer shades which are not so somber and which will not show dust as much. In the textile coverings, colors should be modern and of the neutral tints which convey a restful feeling to the passenger.

In last year's report mention was made of linen slip covers for seats as a means of creating the impression of cleanliness and modern appearance. It is also a practice that may be used to cover worn upholstery and make the sets look like new. Figures are now available to show what costs may be expected with their use. The covers on one property cost less than \$1 each and can be laundered for a cost varying from 2½ to 4 cents each. Their estimated life is approximately one year and it is stated that they may be used either side out.

It is almost universal practice in electric car construction to place the seats on the same centers as the car posts, so as to provide one entire window to each seat. In bus body construction this rule is not rigidly adhered to and the seats are spaced as desired irrespective of the distance between posts. This has been accomplished without serious adverse criticism and so establishes a precedent that may be followed in car construction where it is desired to use thicker seat backs with spring upholstery, or backs with greater pitch to increase their comfort. It also offers a suggestion for bettering the appearance of cars by the use of wider windows than those used at present. Wider windows have heretofore been discouraged on the basis that if a seat be provided for each window it would reduce the seating capacity materially, but this practice would allow almost any spacing of the posts.

During the past two years many experiments have been tried in the equipment of cars, both city and interurban, with better quality seats. The results of these tests are now becoming available and the consensus of opinion is that the provision of better seats is an entirely justifiable expenditure and attracts added patronage of sufficient volume to make it a paying venture. Attention is called to the need of the development of a type of seat that will provide the desired element of luxurious comfort and yet may be produced at a moderate price. A standardization of

at type is desirable and might help in this condition, although this is thought to be impossible of accomplishment during the present stage of development, at least it cannot be attempted until means of what is required become better crystallized than they are at present. It is to be noted in connection with the use of so-called de luxe cars, or cars fitted up with high-grade seats, modern floors and the many other refinements that go to make up a high-class car, that this entails greater care in cleaning than was the case in the older and less luxurious types of car. The presence of dirt in the fine car is much more noticeable and its presence is intolerable, whereas with the poorer type of car, dirt is not of as great moment, though of course always objectionable.

Next in importance to seats in the furnishing of a comfortable ride is the use of springs and the attendant mounting details which cause the car body to ride well or poorly. There is need for study and research to improve riding qualities. Verdict on this quality should be based not upon personal opinion but upon scientific study with the assistance of a recording seismograph.

Car riders must be given a comfortable ride, so it is of prime importance that in the handling of the cars, smooth starting and stopping be practiced. There is probably nothing more aggravating to the passenger than a jerky stop. To the end that the best may be realized from the equipment, it is recommended that well-equipped instruction schools with competent instructors be provided to give embryo motor men the best possible training. It is also recommended that traveling checkmen be employed to see that the instruction is being put to the best use. Likewise it is recommended that a traveling mechanical inspector ride every car once a month to report on its operating condition.

The subject of car convenience, comfort and appearance is one of the most important questions before the transport men today, as it embodies all of the essentials which go to make successful operation of a property as far as cars are concerned. Unless these features are given their proper consideration, the ride is not a salable commodity and the passenger will not give his patronage if there is any other form of transportation available. The need, therefore, is to furnish a vehicle with the air of luxury about it, which will create a desire in the public to ride in preference to the private auto.

One of the great needs of the industry is to sell its wares first to its own employees, and this means giving them proper tools with which to carry out their work and equipment to which they may point with pride. This is the basis of successful merchandising of the car ride.

The report was signed by O. H. Basquin, James A. Brooks, John A. Dewhurst, E. J. Jonas, G. L. Kippenberger, C. R. McMahon, W. R. McRae, H. S. Williams, chairman.

Car Lighting

RECOMMENDED practice in car lighting was presented by the committee, as follows:

1. The position of the normal reading plane shall be a 45 deg. plane at a height of 33 in. above the car floor at the seats. Attention is called to the fact that in measuring intensities sufficient readings should be taken to insure a fair average of the illumination throughout the car.

2. For adequate and comfortable illumination in street railway cars, an average minimum intensity of 6 foot-candles, measured on the normal reading plane, should be provided. This value of intensity may be obtained by employing the standard Mazda lamp for electric railway service with an efficient diffusing or reflecting accessory and an expenditure of 2 to 4 watts per square foot, measured between bulkheads of the car.

3. In city and suburban cars where standing passengers may cast objectionable shadows on the reading matter of those seated, it is recommended that the lighting units be mounted directly above the seats on the sides or in combination with outlets on the longitudinal center line above the aisle.

4. For interurban cars which usually carry only a seated load, it is recommended that a single row of lighting units, consisting of inclosing domes or open-type reflectors be mounted on the center line above the aisle. In a chair car where seats are arranged with backs to the windows, the above system should be augmented by side lighting, consisting of small open type or inclosing bowl units.

5. It is recommended that provisions be made for the proper illumination of entrance and exit steps. Usually one lamp, equipped ordinarily with an efficient durable metal reflector mounted above each door, will provide for safety and minimum delay.

6. To prevent reflected glare on the motorman's window at night from interior lighting units, it is recommended that a blind or an inclosing screen be placed back of the operator. A sloping glass window will also afford relief from such glare and will enhance vision.

7. It is recommended that the head lining of a car be finished in a light color to secure the greatest possible efficiency in the utilization of natural and artificial light.

A miscellaneous method and practice on car lighting was also presented which included a number of typical arrangements. The selection of a lighting fixture, exclusive of the light source, was considered largely one of individual taste. There is no reason why any efficient lighting unit cannot be clothed with a fixture giving pleasing lines and artistic proportions without seriously affecting its illuminating efficiency.

The modern open-type fixture is equipped with a holder which grips the reflector fitter evenly and firmly to minimize breakage under conditions of car vibration. The "angle of shading" of

a light source by means of an open-type reflector depends chiefly on the location of the lamp filament with respect to the lower edge of the reflector. From general observations many of the reflectors now used in such installations are of inadequate length properly to shield the light sources from the eye of passengers, or are held in fitters with improper lamp positions. It was recommended that open-type reflectors be selected with sufficient length to provide at least 20 deg. "angle of shading" when the light sources are located 7 ft. or less above the floor.

The bowl for dome fixtures employed for center mounting is usually 12 in. in diameter and is ordinarily used with a lamp or lamps not exceeding 150 watts. A greater value of wattage in this size bowl would result in a unit having excessive brightness. With the relatively low mounting height available in the electric railway car, the use of a shallow bowl will usually improve the general appearance and proportion of the installation.

Five typical car plans were presented to illustrate different lighting designs to obtain an illumination intensity of 6 foot-candles on the 45-deg. reading plane in each installation.

The requirements of intensity and distribution in lighting the seating compartments of cars can be met by employing any one of the following systems:

System No. 1. Center lighting with two 56-watt Mazda lamps or a 100-watt, 32-volt lamp, equipped with a shallow reflector recessed in the ceiling and covered by an inclosing bowl of medium or light density white glass.

System No. 2. Center lighting with a 56-watt Mazda lamp or a 50-watt, 32-volt lamp, in a medium density diffusing glass reflector of the open type.

System No. 3. Side lighting with a 36-watt Mazda lamp in a medium density diffusing glass reflector of the open type.

System No. 4. Side lighting with bare 36-watt Mazda lamps.

The report was signed by A. L. Broe, W. W. Brown, H. F. Deninger, J. P. Staples, H. A. Otis, and R. W. Cost, chairman.

Roller Journal Bearings

THROUGH a questionnaire the committee attempted to secure information setting forth results of test applications of roller bearings to car journals. The data submitted showed wide variation of results and in many cases information submitted was very meager. Quite a few experimental installations have been made in recent months and a large number of railway companies are now conducting extensive tests, the results of which are not available at this time. All electric railways now operating cars equipped with roller bearing journals are urged to keep careful record of performance, tests, etc., for the information of the committee. It was not thought advisable to present a summary of data now available, as this

might lead to premature and incorrect conclusions. It is hoped that next year the committee may be in a position to present a complete report, together with some constructive recommendations.

The report was signed by H. A. Allen, V. N. DeLamater, E. M. Lunda, K. W. McPherson, J. S. McWhirter, O. F. Packer, W. C. Sanders, W. C. Wheeler and W. C. Bolt, chairman.

Lubrication

FIFTEEN electric railway companies, three manufacturers of truck and motor equipment and two oil companies active in the lubrication of electric railway equipment were sent a questionnaire on the subject of lubrication.

Answers were received from thirteen electric railway companies, two manufacturers of truck and motor equipment and two oil companies. A summary of these replies was prepared as Appendix C of the report. It indicates general satisfaction with the present method of gear lubrication and shows that no specific standard has been adopted. Local conditions, size of the motors used and the kind of service appear to be the factors deciding the particular method used. The committee is of the opinion that this subject is one which requires constant discussion and the spread of propaganda to develop a greater interest in one of the most vital necessities in the care and maintenance of electric railway equipment.

It recommends that the following paragraph be added between the second and third paragraphs of the fourth article headed "Interurban or High Speed Service" on page 2 of Manual Section E208-26:

"It is recommended that lubricant be applied with the gears moving."

The report was signed by L. W. Jacques, Joseph F. Lamb, J. H. Lucas, A. A. Green, W. G. Stuck, chairman.

Noise Reduction

WORK of the committee for the current year started with the re-vamping of its noise-measuring apparatus, making it more rugged and at the same time adaptable to graphic recording. The second phase of the work consisted of completing the testing of railway gears for sound value, establishing the fact that the most quiet gear is the helical type with the long and short addendum spur, that the standard spur gear follows closely, and that the so-called wisdom tooth pinion produces the most noise. The third concerns the increase of noise due to spread gear centers. Upon the basis of the committee's tests it is recommended that $\frac{1}{8}$ in. be the maximum allowable spread of gear centers.

Another part of the report deals with the economic value of noise reduction, showing the results in life obtained from various amounts of wear of axle bearings and demonstrating the benefit to be obtained from closed original fits and the fallacy of allowing bearings to run almost to the point of destruction.

Tests made at Springfield, Mass., on newly developed car bodies and trucks to establish their noise-reducing value are discussed in the report. The trucks tested are of the automotive type. The tests prove that noise may be much reduced if sufficient precaution is taken.

In another part of the report appears a discussion of the noise of air compressors and mechanically operated doors. Tests show the possibility of the reduction of air compressor noise by about 76 per cent and calls attention to the need of improvement in mechanism and the maintenance of door equipment.

Resilient wheel development is also discussed. Following this is the recommendation that muffling pads be bolted to wheels and gears to help reduce the high-pitched tones emanating from them.

Two appendices of this report describe the noise-measuring device and give a bibliography of the study of noise.

The report was signed by C. Bethel, N. R. Brownier, C. A. Burleson, L. J. Davies, C. J. Ellis, F. L. Hinman, T. H. Minary, Robert M. O'Brien, H. L. Rogers and H. S. Williams, chairman.

Journal Boxes

INVESTIGATIONS indicated that it is difficult to keep the present journal thrust plates in their proper location due to the tendency of the revolving journal to raise one end of the plate. In addition the retainers for the plates in the journal boxes interfere with the proper packing of waste at the sides of the journal.

As there is no certainty that the thrust plates will remain in position and function as originally intended, it will simplify construction to omit them, thereby permitting the elimination of the retainers in the journal box and allowing the waste to be packed properly around the journal.

The committee recommended (1) That the present standards for journal thrust plates shown on pages 466 to 468 inclusive of the 1926 edition of the Engineering Manual (Manual Section E2-26) be withdrawn; (2) that the retainers for the thrust plates now included in the standard designs for journal boxes shown on pages 459 to 463 inclusive of the 1926 edition of the Engineering Manual (Manual Section E2-26) be removed from these designs; (3) that any electric railway desiring to follow steam road practice in regard to journal boxes, contained parts and axles should use the American Railway Association's Standards and Recommended Practices shown in the 1926 A.R.A. Manual, Mechanical Division; (4) that the A.R.A. Standards listed under Recommendation 3 be indexed in the Engineering Manual, giving the sections and pages in the A.R.A. Manual of Standards and Recommended Practices, issue of 1926.

The report was signed by J. D. Barnhart, C. J. Ellis, T. W. Faber, E. P. Locke, Leslie W. Richards, G. A. Tupper, C. H. Turner, H. Savage and W. S. Adams, chairman.

Limits of Wear

LIMITS of wear of the parts affecting gear centers may be divided into two classes.

1. Those parts where clearance is necessary and where wear is unavoidable, such as axle lining fit on the axle and the armature lining fit on the shaft. In these cases more attention to lubrication and closer inspection will result in less wear and the limits can be maintained by comparatively easy repairs.

2. Those parts where clearance is undesirable and wear is avoidable, such as armature bearing housing fit in frame, axle cap fit on frame, axle lining fit in housing, armature bearing fit in housing. Frequent inspection and tightening of bolts will prevent wear at these places.

There seems to have been no universal practice regarding limits of wear affecting gear centers. Some operators, while maintaining very close limits in some parts of their motors, are inclined to disregard entirely other parts of equal or even greater importance. It is thought that by definite recommendations regarding all of these parts attention may be called to the necessity of maintaining limits on all parts affected, resulting in much better operating conditions and longer life of equipment.

The committee reached the following conclusions regarding limits of wear of parts affecting gear centers.

1. Armature bearing housing fit in frame. This is a driving fit as manufactured and no clearance should be allowed in operation.

2. Axle cap fit on frame. This is a driving fit as manufactured and no clearance should be allowed in operation.

3. Axle lining fit in housing. This is a clamping fit as manufactured and no clearance should be allowed in operation.

4. Armature lining fit in housing. This is a press fit as manufactured and no clearance should be allowed in operation.

5. Axle lining fit on axle. New motors are manufactured with a clearance of 0.015 to 0.020 in. between the bore of the lining and the diameter of the axle. The maximum allowable clearance for motors under 50 hp. should be $\frac{1}{16}$ in. in diameter between the axle and the bore of the lining. The maximum allowable clearance on motors over 50 hp. power should be $\frac{1}{8}$ in. in diameter between the axle and the bore of the lining.

6. Armature lining fit on shaft. New motors are manufactured with a clearance of 0.006 to 0.013 in. between the bore of the lining and the diameter of the shaft. The maximum allowable clearance for motors under 50 hp. should be $\frac{1}{16}$ in. in diameter between the shaft and the bore of the linings. Maximum allowable clearance for motors over 50 hp. should be $\frac{1}{8}$ in. in diameter between the shaft and the bore of the lining.

The committee recommends that its conclusions be adopted by the standing committee on rolling stock as recommended practice for operators.

The report was signed by C. Bethel, F. L. Hinman, J. H. Lucas, W. R. McRae, D. F. Smith and J. M. Bos-enbury, chairman.

T.&T. Committees Present Experiences

Reports on bus operation, traffic and safety and service betterment outline methods followed and results obtained on many properties. Few definite recommendations are made. Bonus and award report presented at joint session with Claims Association

SUGGESTIONS rather than recommendations were the gist of the reports presented this year by committees of the Transportation and Traffic Association. On account of the broad subjects chosen, bus operation, traffic and safety and service betterment, it was thought desirable to refrain from specific recommendations and confine the reports largely to experience statements. Abstracts of these reports are given below.

Bus Operation

EFFORTS of the committee have been devoted almost exclusively to attempt to learn from the industry itself such lessons as might be helpful at whatever conclusions it has reached as developed from the experience of railway companies operating buses. In order to get a comprehensive cross-section of the industry the committee selected 55 of the large bus operations by electric railway companies where buses were operated in conjunction with the railway systems, including not only the larger cities but also smaller systems where they were typical of their localities or states. Fifty-two surveys of bus operations were received. These surveys were further checked against the operating data furnished headquarters by more than one hundred companies, and in some instances were supplemented by the committee's inspections. The committee sought the opinion as well as the experience of the industry and consequently has not attempted a summary of figures but rather a report

1. General economics of bus operation.

2. Types and sizes of equipment.

3. Fares and fare collections.

4. Operating rules.

The fifty-two companies who replied to the questionnaire own 3,084 buses or nearly half the 7,000 buses owned by the electric railway industry and operate 563 bus routes over a route mileage of 6,731 miles divided as follows:

Kind of service	No. of routes	Miles of routes
Urban	332	1,416
Suburban	103	573
Interurban	128	4,742

About 80 per cent of these companies were quite certain their bus operations were justified. This positive answer was given by men who were experienced in the transportation business and were entirely familiar with their local situations, and can probably be accepted without any question, but apparently few, if any of them, had studied the facts sufficiently to definitely place an approximate value on the use of the bus for this service.

It is the conclusion of the committee that electric railway companies have a surprising lack of knowledge of the economics of transportation.

Of the total of 3,084 buses owned by the companies reporting 35.4 per cent were of 29-passenger capacity, 16.6 per cent were 21-passenger, 15.2 per cent were double-deck and the remainder, amounting to 38.8 per cent, were of various capacities, probably mostly 25-passenger. The trend to the use of the larger single-deck vehicle seems to be pronounced throughout the industry. As a general rule no change is made in the size of vehicle operated at different periods of the day, because usually the trouble and cost of making the change would wipe out any economies that might result from the operation of a smaller vehicle during the time of lighter traffic.

One interesting point brought out was the rather low results in passengers per bus mile prevailing on many routes. Under urban operations the maximum number of passengers per bus mile carried was 17.3; the minimum 0.37 and the average for 40 companies operating



J. V. Sullivan

such service, 3.75. On many of the routes showing a low passengers per bus mile a large size vehicle is being used. In several cases with the passengers per bus mile below this average double-deck buses were being operated. Of course there may be conditions that make it desirable or necessary to use a large vehicle for light traffic, but there is an indication from the replies to this question that more study should be given to the subject of the application of the proper size vehicle, and that economies might be realized by using a smaller and therefore cheaper vehicle under some conditions.

Under the suburban operations the maximum number of passengers per bus mile carried was 4.31; the minimum, .040; and the average for 7 companies operating such service was 2.25. Under interurban operations the maximum was 12.0; the minimum, .21; and the average for 11 companies operating such service was .268.

In addition to selecting the proper size of equipment to fit the service to be given it is necessary also to use judgment in determining the type of equipment. For general purposes, buses can be classified in three types.

- (a) Double-deck buses.
- (b) Single-deck pay-enter buses.
- (c) Single-deck de luxe coaches.

The kinds of service for which buses are now being used by transportation companies might be divided into four classes:

1. Supplementary to electric railway operation.



R. N. Graham

of what is being done universally, the trends throughout the country, if there be such, and finally, the composite thought of the industry where averages could be struck.

After completing this survey the subjects presented for particular consideration seemed to divide themselves naturally under four heads as follows:

2. Combination with electric railway service for local and express service.

3. De luxe or special route service.

4. Charter and touring service.

Practically one-half the operating companies canvassed have selected certain types of equipment which they deem of best economy to use and use them generally in their service. After carefully analyzing the figures on operating expenses of sizes and makes of buses submitted by these companies, this committee is of the opinion that experience in bus operation is still too brief for accurate observation as to differentials in cost between them.

Twenty companies of the 52 answering the questionnaire have also furnished to the association a complete record of their revenue and expenses for the year 1926. Seven of these twenty companies, or 35 per cent, had operating revenue sufficient to pay a return on the investment after meeting operating expenses, taxes and depreciation. Five of this group of seven companies were charging higher fares than were charged on associated railway lines. Of the thirteen companies which did not have any income available for a return on the investment, only six were using a higher fare than associated railway lines. Two companies, or one-tenth of this group, have been able to pay some return on the capital invested and keep their bus fares on the same level as railway fares.

Twenty-six of the 52 companies answering the questionnaire have higher fares for bus service than for car service. Fifteen of the remaining 26 which use a similar fare for both charge higher rates for certain bus service. This leaves only eleven of the 52, or about one-fifth, operating bus and rail service at a universal fare.

In contrast to the actual relation of bus and rail fares, forty-five of the fifty-two operators say the bus fares must of necessity be the higher, the opinions ranging from "slightly" to "two and one-half times." Five operators are of the opinion that bus fares and rail fares should be the same. Two were unable to answer. Guided by experience, an overwhelming proportion of the industry believes that bus fares should not be the same as rail fares. Answers to the question regarding the proper method for determining bus fares shows conclusively that the operators believe the service should be self-supporting.

Supplementary service is usually operated under the name of and co-ordinated with street railway service. Street railway fares and interchange of transfers frequently obtain. In any case, the service rendered is comparable with that given by the street railways and the fare is not materially higher.

De luxe city service in some instances parallels railway operations. The equipment used should be more elaborate and a higher rate of fare is charged than in regular service. Intercity service is distinct from the two classes previously described in that the length of route is considerably longer. Fares are usually based on a zone or mileage plan. Char-

tered service may be either of local or interurban city type and the rates are ordinarily based on the length of trip or time consumed rather than on the number of passengers carried.

Extensions to present lines and new routes into unserved territory are now being made very largely by the use of the bus. With this new type of equipment, there is the opportunity of making trial installations of the service with a fare structure entirely divorced from the basic franchise limitations on the general transportation system.

It is evident to the committee that the transportation facilities cannot be increased unless the people served and the municipal authorities can be convinced of the necessity of supplying sufficient revenue to provide a reasonable rate of return on the capital invested. In some cases this should be secured through a higher fare on the extension, adequate to cover the cost of the new undertaking. In other cases the general fare must be sufficient to supply the surplus for the purpose of covering the losses on such extensions.

Rules for the guidance of bus operators are given in an appendix.

The report was signed by J. L. Alexander, H. L. Bollum, C. H. Chapman, C. B. Cooke, Jr., E. D. Dreyfus, D. L. Fennell, S. W. Greenland, M. L. Harry, R. B. Hill, Adrian Hughes, Jr., Daniel S. Mackay, H. G. Monger, Thomas W. Noonan, E. S. Pardoe, D. A. Scanlon, Alexander Shapiro, D. A. Smith, J. L. Smith, A. T. Warner, C. V. Wood, Jr., B. W. Arnold, vice-chairman; R. N. Graham, chairman; A. R. Myers, sponsor, and Paul E. Wilson, sponsor.

Traffic and Safety

RELIEF of street traffic congestion is the subject to which the committee has devoted most attention. The report states that there has been a well-directed tendency during the past few years toward comprehensive street



H. K. Bennett

traffic surveys in a number of cities. The opportunity to reduce operating costs, increase revenue and build a better position in the community should induce railway operators to align themselves with this movement for street

traffic relief. Street railway operators not only can render much assistance in the collection of data on practices which increase congestion, and through study of efficient methods of traffic control can assist in drafting relief measures, but these operators are often best qualified to take charge of this traffic survey. Street railway executives should be known for leadership. This leadership will not be misdirected if applied to investigations to obtain a more equitable and more efficient use of public property.

Signal control and traffic restrictions should be considered together in relief



C. H. Evenson

of traffic congestion. As mechanical signal control can reduce delay by giving the proper time intervals at the intersection, so also can enforced traffic restrictions reduce congestion by opening to use the full street width and taking advantage of this time and space by reducing conflicting movements to a minimum.

Street traffic congestion may be regarded as composed of two factors: First, movement of traffic, and second temporary storage of vehicles on streets. A comprehensive system of traffic regulations must give consideration to these two types of street use.

Too often at intersections an unsuccessful search is made for traffic signal timings to handle the heavy interesting movements, while parking, which reduces by half in many instances the number of moving lanes, is unrestricted. Intersections are throats which limit traffic flow. At intersections of heavy traffic streets, where time must be divided between two or more movements the full width of street should be made available. Parking restrictions near intersections, both in principal business districts and outlying business section should extend at least 100 ft. back from the curb corners. If this distance is shorter, the few vehicles which can accumulate in the extra lanes will not require the full movement to clear the intersection. Thus to obtain the best use of such reservoir capacity at isolated intersections the restricted space should be sufficiently long to accumulate during the "Stop" period a line of vehicles which will require nearly the full movement to clear the intersection.

Closely allied to parking restrictions means of obtaining more effective street use is the desirable restriction of important or necessary movements, particularly at intersections. Movements which must give way to permit faster speed, less conflict, more effective street use and fewer accidents are chiefly left turns at some intersections and "U" turns on congested streets. We shall probably see more restriction of the right turn privilege where heavy pedestrian traffic must be accommodated. Such conflicting movements can well be referred to adjacent or near-by intersections where the conditions will permit the movements without appreciable interference to traffic. This change need not inconvenience the driver whose moment at the busiest intersection is restricted. He can plan his turns accordingly and the time saving and increased freedom of street travel will be very marked.

An effective means of reducing traffic congestion, the committee recommends:

1. A comprehensive traffic survey to gather facts on present street use and recommend methods of using street facilities to their fullest extent.

2. Traffic studies to precede installation of mechanical signal control. These observations and data should determine first the desirability of signal installation and, when signal control is justified, further study to determine the proper timing.

3. That signal-controlled intersections less than 1,000 ft. apart should be operated wherever possible as a system after proper studies are made to determine settings which will give a progressive movement through such intersections.

4. Elimination of parking on busy thoroughfares as one of the most effective means of increasing the usefulness of the streets.

5. Restrictions against left turns at important intersections and prohibition of "U" turns in mid-block, when the delay and accident hazard which results more than offsets the convenience offered by this flexibility.

The subjects of standard classification of accidents and separation of accidents into "chargeable" and "non-chargeable" groups were also considered by this committee. A summary of recommendations of the recent Chicago street traffic survey is included as an appendix to the report. It was believed that this might prove useful in other cities contemplating similar surveys.

For the T. and T. Association the report was signed by A. W. Brohman, J. I. Butler, Ralph W. Emerson, Arthur Laboury, J. P. Ingle, Richard Merivether, J. A. Miller, Jr., W. R. Power, E. S. Rider, E. C. Spring, J. A. Stoll, A. J. Fink, vice-chairman; C. H. Evenston, co-chairman; W. H. Boyce, sponsor, and Samuel Riddle, sponsor. For the Claims Association the report was signed by Seth W. Baldwin, Neil W. Dun, George H. Ingles, A. G. Jack, Rev. C. Neilson, Victor T. Noonan, Edwin J. Paige, John J. Reynolds, J. J. Shaley, Russell A. Sears, sponsor, and I. H. Bennett, co-chairman.

Bonus and Award Systems

BETWEEN 40 and 50 properties are using different forms of bonus and award for the reduction of accidents. It is not only the smaller companies that are included in the list. Two companies which recently have put a bonus system into use are the Brooklyn City Railroad and the Public Service Railway of New Jersey. Bonus systems are also in effect in Birmingham, Denver, Los Angeles, Milwaukee, Nashville, St. Louis and Washington.

It may be that the adoption of such a plan at a time when accidents already are at a minimum without it would constitute a mistake in judgment. A com-



G. T. Hellmuth

pany in such a situation would be interested in bonus and award only as a plan for a possible future activity when other methods for preventing accidents had been exhausted and the company was beset by mounting accident figures. Safety work is inspirational in character, and from time to time new methods must be introduced.

Objection has been made to the giving of a bonus on two grounds: (1) that the number of unreported accidents will be increased and (2) that it is wrong in principle to pay again for what should be given in return for the day's wages—viz., careful and safe operation.

As to the first objection, letters from users of the plan indicate that with the proper system unreported accidents will be decreased. As to the second objection, it is well known that a reward given for work particularly well done

is a sound business proposition. The idea is not confined to railway operation.

The Brooklyn City Railroad put a bonus plan into effect on Aug. 1, 1926, and no changes have been made in the original plan since that time. The first awards under this bonus plan were made on Dec. 15, 1926, at which time \$20,770 was paid to 1,876 conductors and motormen. This was an average of \$11.05 per man and 86.4 per cent of the conductors and motormen participated. During the current bonus year and as of June 30, 1927, conductors and motormen had earned a total bonus of \$47,365. With deductions for men leaving the service, it is estimated that the cost of the bonus for the year ending Nov. 30, 1927, will be approximately \$60,000.

For eleven months ended June 30, 1927, accidents on this system have decreased 11.5 per cent, and the severity of the accident has been greatly diminished; 62.4 per cent of all accidents are car and vehicle collisions. Conductors and motormen could have prevented and therefore are found to be at fault for 40.5 per cent of all accidents. "Blind" accidents have decreased 32.4 per cent during the eleven months of the bonus as compared with the same period of the previous year.

The bonus plan of Public Service Railway was put into effect Dec. 3, 1926. For the first five months of the year there was a falling off of 4.54 per cent in accidents per million passengers carried.

In 1918 organized accident prevention work was begun by the Tennessee Electric Power Company and has been continuously carried on ever since. For the ten years preceding 1918 the average cost of the claims department was 12 per cent of the gross passenger revenue earned. For the years 1919 to 1926 inclusive the cost has been 4.78 per cent.

Since this property inaugurated the bonus plan in connection with accident prevention work, it has been able to reduce its pull-ins from 350 to 49 per month, and its equipment is old and hard to keep up.

Details are given concerning the methods of giving bonus and awards by the companies mentioned and also those of the Milwaukee Electric Railway & Light Company, and the Los Angeles Railway.

The report was signed by B. D. Haskins, A. W. Kohler and G. T. Hellmuth, chairman.

TABLE SHOWING ACCIDENT AND CLAIM RECORDS OF TENNESSEE ELECTRIC POWER COMPANY RAILWAY DEPARTMENT

	Total No.	Accidents— Collisions with Motor Vehicles	Cars	Claims	Gross	Per Cent Claims to Gross
1917.....	2,291	.....	..	\$120,010	\$672,646	17.8
1918.....	2,793	.....	..	152,604	860,275	17.7
1919.....	2,182	.....	..	66,356	857,372	7.7
1920.....	2,456	2,436	83	77,205	1,084,653	7.1
1921.....	1,753	2,132	60	42,050	978,202	4.3
1922.....	1,634	432	19	39,161	958,132	4.09
1923.....	1,846	571	23	55,311	970,889	5.69
1924.....	1,300	515	22	59,885	1,589,418	3.76
1925.....	1,649	654	23	28,398	1,675,270	1.69
1926.....	1,583	691	52	58,733	1,735,843	3.38

Service Betterment

It was felt by the committee that the subject of service betterment divides itself naturally into two main topics:

1. Increasing speed.
2. Providing greater comfort and convenience.

The first main topic was further subdivided into two headings:

- (a) Increasing speed in congested districts.
- (b) Increasing speed in outlying districts.

The second main topic was subdivided into two headings also:

- (a) Increasing the comfort of the car itself.
- (b) Increasing the convenience of the service.

The committee suggested the adoption of a modified plan of selected stop operation, where conditions do not admit of complete stop selection. Under this plan, all stops would be available to riders for the greater portion of the day, but on the peak trips, when headways are more frequent, riding is heavier and speeds are ordinarily slower, alternate stops would not be made. These points should be designated by special pole symbols and neat metal signs setting forth clearly the hours when cars do not make the stops.

The committee urged member companies to give the matters of running time and layover time renewed study and careful analysis, with the view of obtaining the highest speeds consistent with good operation. It also emphasized the importance of selecting proper motors and gear ratios for any given service, the importance, from the speed standpoint alone, of so maintaining the brake equipment that stops can be made in the minimum distance consistent with passenger comfort.

A number of companies have devised ways of increasing surface car speeds by the operation of express cars or buses.

The most usual type of express service is where there are two parallel car lines or a bus line paralleling a car line. The committee felt that it is preferable for the street car line to take care of the long-haul business and operate as an express line, leaving the bus line a shorter route handling local business. Another type of express service which has worked out successfully in city service is the usual steam railroad or interurban railroad plan of operating expresses and locals on the same tracks. This can be done by careful scheduling and judicious selection of the "express" territory when headways are not too close and when a fairly infrequent local car headway can be given. The committee offered the suggestion that cars may be speeded up by the substitution of air whistles, electric horns or other modern warning signals for the present type of foot gong.

Special attention was given to the relationship of contact and convenience and attractiveness of service. Many problems in the sale of service have been caused by lack of contact with the cus-

tomers, the salesman and the field in which transportation is sold. It is believed that partial ignorance of exact conditions has created confusion on the part of managements in attempting to decide upon and maintain a policy which would bring about a convenient and attractive service or the proper co-ordination of bus and street car service.

Dependent on the density of population, there is need for two or more classes of service. Speed and comfort are factors in determining the need for express lines which may co-ordinate with slower urban electric railway operation. Street railway companies, however, are cautioned against making promiscuous substitutions of bus lines for rail lines. It is easy to be over-optimistic as to increased receipts from bus operation, and one cannot be too



S. E. Emmons

conservative in figuring bus operating costs. Furthermore, railway overheads continue after the abandonment of a branch line, and the railway operating expenses may not be decreased by the amount estimated. Then, too, when a railway line is abandoned, there is a loss of valuation, upon which a rate of return is figured, which probably will not be replaced by anything approaching an equivalent figure from the bus operation. Very often what appears at first glance to be a proper case for rail abandonment and the substitution of buses resolves itself into a clear-cut proposition for rehabilitation of the rail service, when all factors are given proper weight.

Most companies own several classes of passenger equipment, and a preference is shown by the riders for certain classes. A management should make every effort to increase the use of the preferred equipment and to cut down the use of less popular equipment.

On one property this matter was given careful study, and it was found possible to increase the average number of miles per day for the good cars from 80 to 90 miles, with the result that three unpopular classes of equipment totaling 134 cars were retired completely and 42 other cars were retired from regular service. The change resulted in giving the riders much better car service, gaining good will, building up receipts and reducing operating expenses

—an extremely profitable undertaking all around.

Good housekeeping is a comparatively inexpensive form of maintenance, yet the return in added attractiveness is large for the small investment. A reputation for having clean cars and buses, immaculate car houses and waiting rooms, well policed right-of-way, etc., will bring forth a very favorable public reaction and will go far toward the creation of an appearance of prosperity which will inspire confidence in the road and its management. Car painting is one of the last things to neglect, purely aside from the fact that depreciation of car bodies increases rapidly when painting is skimmed, for not even the best of service can be really attractive if it is supplied with dingy, faded, unprosperous looking vehicles.

Much can still be done toward noise reduction. Noise elimination should be considered from two angles: noises inside the car and those reaching persons not riding in the car. The first presents the easier problem. This solution is more in the nature of noise exclusion and is effected by floor coverings, insulated linings, window weather-stripping, roof head-lining, etc. The second or exterior, class of noise is much more difficult to overcome. It has to deal primarily with the amount of unsprung weight, class of brake rigging, gearing and condition of rail. Recent experiments in spring suspended motors, worm gear drive, etc., should be watched with the keenest interest.

In recent years the industry has added to the comfort of its patrons by giving them more comfortable seats. Longitudinal seats have been replaced almost entirely by transverse seats, except around loading areas, but there is still improper seat spacing. In the judgment of the committee it is more desirable to have a somewhat smaller number of passengers comfortably seated than to provide the few additional seats to the discomfort of all seated passengers.

New cars, in most cases, should be designed for some form of modern luxurious, deep-cushioned seats. The report warns against the assumption that because an industrial class of people are to be served good seats are not warranted. Experience has shown in a number of cases that these are the very people who can be induced to ride more frequently through the medium of more comfortable service. It is generally found that luxurious seats have a strong appeal to all classes of riders.

The most prominent things on the streets of most cities are the street cars and a favorable or unfavorable opinion of a city may be gained subconsciously through the exterior appearance of these cars. The same is true of buses.

The report was signed by Walter H. Burke, F. J. Denney, John A. Dewhurst, W. J. Flickinger, J. A. Greig, A. I. Hedges, R. H. Horton, E. A. Palmer, A. E. Potter, J. P. Potter, A. C. Spurr, J. B. Stewart, Jr., J. C. Thirlwall, W. E. Thompson, C. D. Smith, vice-chairman, S. E. Emmons, chairman, G. B. Anderson, sponsor, and Edward Dana, sponsor.

News of the Industry

Hearing on Madison Fares Under Way

A hearing on the petition of the Madison Railway, Madison, Wis., for a 10-cent fare was started before the Wisconsin Railroad Commission on Sept. 27. An agreement has been reached between the city and the company whereby the city will repair the track joints on ten streets at a cost not to exceed \$7,500. The company will reimburse the city at a rate of \$500 a month. Gross revenue received by the company for August was practically the same as that of August, 1926. The gross revenue was \$30,342, compared with \$30,401 for a similar month last year.

lines and a network of bus lines; municipal acquisition of the system at any time and payment to the city of 2 per cent of the gross receipts of the system.

D. W. Pontius, general manager of the Pacific Electric Railway, stated that if the offer were accepted a large amount of additional capital would be

necessary and it was understood that the offer would have to win the approval of the board of directors of the company. In making this offer the company proposed to buy the B. & H. Transportation Company and asked cancellation of revocable permits under which the West Side Transit Company ran buses.

Smith Report Published

Suggests fare increase with unified system for New York City and attacks waste of city-owned lines. Buses essential as feeders

TWELVE recommendations are made in the report of Charles Edward Smith, noted transit expert, called in by the city of New York to make a survey and analysis of its traction problem. Although not released by Comptroller Berry, the report was published by several of the New York newspapers.

An outstanding suggestion is given as the substitution of a flexible fare, starting at 7 cents, with four rides for 25 cents, in place of the existing 5-cent rate. Other recommendations are issuance of transfers at all points, without the payment of any extra fare; adjustment of the fixed guarantees of the elevated and Interborough lines in Manhattan; reduction of the Manhattan elevated interest rate from 7 per cent to 5 per cent; cancellation of present deficits to re-establish credits; pooling of net revenues; lowering of the city's rate of interest on its investment from 8.76 per cent to the present sinking fund rate; control of surpluses by the city and the transportation companies; appointment of a board of control to fix fares, operating allowances and other rates, this board to consist of the comptroller, Chairman of the Transit Commission and a representative of the transportation companies; a division of the surpluses, one-half to the surplus fund, one-quarter to the transportation company and one quarter to personnel; issuance of city bonds for construction, and an agreement by the cities and the transportation companies to obtain enabling state legislation.

To the war he ascribes the financial and service troubles of all the transit companies in recent years. The rapid transit systems in New York he termed a "miracle of modern science" which should be "co-ordinated into a unified system at always self-supporting fares with free transfers." Mr. Smith finds a fixed 5-cent fare unworkable.

Among the revelations in the report is the statement that the new city subway system is going to cost \$140,000,000 more than the official estimate, bringing the total to \$842,000,000 and that even

then the city will not have the needed coverage of territory. He added that the old Transit Commission's plans, which provide for extension and amplification of the existing lines and do not include city-owned new lines, could be achieved for \$300,000,000 and would accomplish approximately the same purpose with a saving of \$500,000,000. City officials were condemned for not giving relief to the transit companies in 1918 for thorough lack of revenue, operation has been kept in a stage which while not entirely dangerous could not be called definitely safe.

He finds that over a period of nine years the cost of carrying a passenger on the Interborough Rapid Transit Company (from 1919 to 1927) averaged 6.143 cents and adds "this fare on the Manhattan elevated and surface lines will secure improved service and relieve the companies from unfair financial troubles." This would be an increase of only 25 per cent and would correspond to a 4-cent fare before the war.

Mr. Smith considers buses essential to any well-integrated city, not taking the place of but rather supplementing the service rendered by subways, surface lines and elevated roads. The cost of buses superseding the electric railway he estimated at \$25,000,000 to \$40,000,000. In crosstown service in narrow congested streets where the lines of traffic are frequently diverted and as feeders to surface and rapid transit lines there is a wide field for buses in New York, he claims. But there is no place for them, he feels, in competition with surface lines because they cripple the service of the surface lines and ultimately stop them without being able to handle all the traffic as well, as economically or as speedily.

At the invitation of the Board of Estimate and at the personal request of Comptroller Berry Mr. Smith arrived from St. Louis last spring to study the transit situation in New York City. The engineer's report consists of approximately 30,000 words. The report will be summarized in a later issue of the *ELECTRIC RAILWAY JOURNAL*.

Superior Company Claims Fare Insufficient

The Duluth Street Railway, operating in Duluth, Minn., and Superior, Wis., at a hearing before the Wisconsin Railroad Commission asked for the establishment of a new fare rate base in Superior, Wis. The company set forth a valuation of \$1,225,000. It submitted figures showing that earnings have decreased and asserted that the present cash fare of 10 cents and five tickets for 30 cents were insufficient.

Transport Offer for Long Beach, Cal.

A unified system of rail-bus transportation was offered to the City Council of Long Beach, Cal., in a comprehensive plan worked out by the Pacific Electric Railway. Conceding a point insisted upon by City Manager Callahan and former City Manager Henderson, the company asks for a 7 per cent guaranteed return instead of an 8 per cent one. The offer is a revision of the program submitted on Dec. 7, 1926. The important provisions include the following: Valuation of the Long Beach system by the Railroad Commission to establish a fare base; a fare of 10 cents on all regular and bus lines within the City of Long Beach, tickets to be sold at the rate of 5 cents for 50 cents good within the City of Long Beach, except that they will not be honored north of San Antonio Drive; a 3½-cent fare for school children; purchase of books of 30 tickets for \$1, not to be honored north of San Antonio Drive; stipulation that there will be no change in the fare for two years and after that time raising or lowering it according to whether the return is more or less than 7 per cent; the placing in service of a minimum of 50 modern pneumatic-tired buses; a 35-year car franchise and a 10-year bus franchise; extension of rail

Sunday \$1 Ticket Popular in Boston

The Eastern Massachusetts Street Railway, Boston, Mass., has made the Sunday \$1 ticket so popular that it is now selling as many as 4,000 for a Sunday. With one of these tickets a passenger can ride all day, as much as he desires, on the Eastern Massachusetts system, back and forth on a single line, or from one end of the system to the other and back. There is no limit. Such riding has become a popular diversion in some sections. The trip one rider took from Fall River meant about nine hours of riding and would have cost about \$8 on the regular fare basis.

Vetoes Wilcox Survey—Suggests Report from Specialists

San Francisco's Mayor and Supervisors, at the height of a municipal election campaign, are involved in a bitter controversy over the appointment of Delos F. Wilcox of Grand Rapids, Mich., as an expert to survey the transportation situation in San Francisco. Mr. Wilcox was selected by unanimous vote of the Board of Supervisors and engaged at a salary of \$10,000 for two months' work. Mayor James Rolph, Jr., however, refused to approve the appointment.

In a veto message the Mayor openly declared that Mr. Wilcox is "a municipal ownership enthusiast without practical experience in the construction, management and operation of street railways." Supervisors are endeavoring to line up the fourteen votes necessary to override the veto. In the meantime the expert remains on the job.

Mayor Rolph urged in his vote of veto that instead of employing Mr. Wilcox the Supervisors select a board of three to be chosen for outstanding technical ability in the construction, operation and valuation of street railways, as well as franchise matters. He declared that the problem was one that should be studied calmly by a board of experts.

The future of San Francisco's street car operation is rather hazy at the present time. Market Street Railway franchises begin to expire in 1929 and the policy of the city as to the disposition of these franchises is still undetermined. Ardent municipal ownership advocates are in favor of the city taking over the lines of the Market Street Railway as the franchises expire and thus augmenting the municipal railway system. Others, however, who are against this policy, advocate the continuance of two competing railway systems. As yet no constructive future policy has been evolved. It was to study the situation that Mr. Wilcox was employed.

In part Mayor Rolph said:

What is required is not a further discussion of a principle already settled, but a practical demonstration by the best experts of how the physical and legal problems con-

fronting the city can be solved. The legal problems can be disposed of by the city attorney. The physical problems should be clarified by engineering experts of the greatest skill and experience. A plan out-

lined by a board of this character will receive the confidence and support of the people. I therefore recommend to the honorable board that you provide for a board of experts.

Storm Hits St. Louis Utilities

Railways and Bus Companies Unite in Disaster to Carry Stunned Passengers—United Railways Suffers Heaviest Loss, Amounting to \$250,000—Service Resumed on All Lines

WHEN the tornado which killed 89 persons, injured 1,200 others and did property damage estimated at \$15,000,000 to \$50,000,000 in St. Louis, Mo., and Venice, Madison and Granite City, Ill., on Sept. 29 had passed into history the United Railways, St. Louis; the Illinois Traction System, the St. Louis, Alton & Granite City, the East St. Louis & Suburban Railway companies and the People's Motorbus Company found that several of their main lines had been put out of commission.

The United Railways, St. Louis, suffered a loss of \$250,000, an estimate set Oct. 2 by Col. A. T. Perkins, general manager for Receiver Rolla Wells. The loss does not take into consideration passenger revenue due to the storm. For a time all the major lines of the city leading into North St. Louis were put out of commission. Right after the terrible storm struck it was believed the loss to the company would be \$600,000 or more.

Two of the company's carhouses were badly wrecked and sheds were damaged to the extent of about \$150,000. Damage to the street cars totaled about \$75,000. Eight cars housed in the carhouse at Spring Avenue and North Market Street are a total loss, while 200 other cars were damaged. The injury to overhead wires and cables will be about \$35,000, Col. Perkins estimated.

Within twelve hours the United Railways emergency forces had restored service on all but seven of the lines affected and by Oct. 1 all lines were in full operation but the Cass division, which has since resumed operation.

When the storm swept through the residential district from Kingshighway and Manchester Avenue northeastwardly several hundred thousand men and women were in the downtown offices and stores and the industrial plants that skirt the Mississippi River. Many were not aware of the extent of the storm until they endeavored to get to their homes. Every street car line leading into North St. Louis was out of service.

Practically two-thirds of the city was without railway facilities and this big load at its very peak period was thrown onto other transportation systems, especially the People's Motorbus Company and the St. Louis Bus Company, the latter a subsidiary of the United Railways.

Many from the People's company's regular forces and extra men were sent into the district swept by the twister to clear away debris, remove overhanging wires and otherwise clear the way

for the buses. That company also buses to act as ambulances.

Buses of the St. Louis Bus Company proved of the utmost value on Thursday night and throughout Friday in augmenting the handicapped street lines, while in Illinois a similar service was rendered by buses of the Blue G Motorbus Company, subsidiary of East St. Louis & Suburban Railway during the ten-hour period in which trolley lines through the Tri-Cities to Alton, Ill., were out of service.

Several out-of-town bus lines coming into St. Louis also pressed their buses into city service and did what could to supplement the service of car company and the People's company.

But while the service cars were doing all that the traffic would bear, greatly increased tariff the regularly operated main taxicab lines and the companies did not raise their rates. However, it was very difficult to taxicabs from the regular companies since many were used as ambulances. While the service car operators raised their rates, thousands of owners of private automobiles proved equal to the city's big emergency by carrying persons to their homes. Crawling slowly out of the downtown district many high-priced five-passenger sedans were carrying a dozen riders.

Thousands of St. Louisians were forced to walk miles to get to their homes, while others unable to walk the way did not get home until midnight. In normal times the street cars carry persons from the main business sections to parts of northeast, southwest St. Louis farthest removed from the downtown section in minutes.

Baltimore Advertises for More Riders

Since being refused an increased emergency fare by the Public Service Commission, the United Railways & Electric Company, Baltimore, Md., has launched an increased advertising campaign, have appeared on the streets with placards calling attention to the cheapness of trolley riding and other advantages of using that means of transportation.

Meanwhile the company is preparing for the hearing before the commission scheduled to open Oct. 26, on its petition for a permanent 10-cent fare. L. Clark, counsel for the People's Motorbus Company, announced that he would submit a new schedule whereby his riders would be given a preferred

Recent Bus Developments

Fares Cut on Kansas City Bus Line

Bus fares on the Country Club express line during the non-rush period each weekday were reduced from 25 cents to 19 cents, effective Oct. 1. The reduced rate is in force each weekday between 9 a.m. and 4:30 p.m. and again at 7 o'clock at night. The 25-cent rate will be charged all day on Sundays and holidays.

The purpose of this reduction is to increase the patronage on the express line during the non-rush hours in order to make the line a paying venture, according to Fred G. Buffe, vice-president of the Kansas City Public Service Company.

Tickets at the new rate of slightly less than 20 cents are being sold at the street car dispatchers' stations, scattered over the city at important corners, and at drug stores. They may also be obtained from the public service company's central office by mail.

Bus Territory Expanded in San Diego

The San Diego Electric Railway has recently extended the scope of its bus operations by taking over the Lloyd's El Cajon Stage Line, operating between San Diego, Cal., and El Cajon, and serving intermediate points including La Mesa and Grossmont. Application for certificate of public convenience and necessity was filed with the Railroad Commission by Sutherland's Tia Juana Pages, a competing stage operator, to operate between San Diego and La Mesa, thereby serving territory which is directly in line with extension of the railway system, and it was for this reason that the railway purchased the Lloyd line and also filed counter applications with the commission. After public hearing, all applications for additional service to La Mesa were denied by the Railroad Commission, which, however, notified the sale of the Lloyd line and advocated increases in schedules to afford adequate facilities. Approximately 16 miles of bus route have been added to the system.

Equitable Grant Termed Illegal

That the bus franchise awarded to the Equitable Coach Company was illegal was the opinion expressed at the hearing by the Transit Commission on Oct. 3 by Clarence J. Shearn, of counsel for the Brooklyn-Manhattan Transit Corporation, and Max D. Steuer, of counsel for the New York Railways Corporation. The contenders attributed the illegality of the bus franchise for Manhattan, Brooklyn and Queens to the failure of Borough Presidents Julius Miller of Manhattan and Henry Bruck-

ner of the Bronx to vote for it in person.

Commissioner Leon G. Godley, who presided, suspended the taking of testimony on the company's application until the next hearing. He said he would then decide on the legal points raised. The point raised by these counsels hinged on whether or not a borough president had the power to delegate his authority and vote in the Board of Estimate to his Commissioner of Public Works.

Buses Accommodate Toledo Students

A number of variations in bus routes operated by the Community Traction Company, Toledo, Ohio, has been made effective recently to accommodate school students. Two of the express lines route one bus each way daily by way of Scott High School, a special bus collects passengers each morning in the north section of the city for Waite High School and the Broadway-Glendale bus has been routed in the opposite direction so that pupils of Harvard School may get off on the side of the River Road nearest the school. These arrangements were made through Superintendent Forsgard and Commissioner E. L. Graumlich.

At the present time 15 per cent of all operation of the traction company is by motor coach as against 9 per cent coach operation a year ago. The company has a fleet of 30 coaches and will soon probably purchase additional equipment.

Buses to Run in Hillsboro

Permission has been granted by the Illinois Commerce Commission to the Illinois Power & Light Company to discontinue railway service in Hillsboro, Ill., and substitute a line of buses. The railway system has been in operation there for twenty years.

Bus Extensions on Clay County Line

A permit to the Kansas City, Clay County & St. Joseph Auto Transit Company, a subsidiary of the Kansas City, Clay County & St. Joseph Railway, to operate stage lines between Kansas City and St. Joseph, Kansas City to Excelsior Springs and Liberty and Kansas City to Parkville, was issued by the Public Service Commission at Jefferson City, Mo., on Sept. 24. The application for and the issuance of a permit to the Kansas City, Clay County & St. Joseph Railway to operate buses was in compliance with the provisions of the new Missouri bus law, which became effective July 3, R. F. Mahan, general superintendent of the company, said. The company started the operation of buses three years ago.

Hearing for Richmond Bus Petition Continued

The Virginia Corporation Commission has continued to Nov. 16 the hearing of the Sandston Railway, Richmond, on its petition for a certificate of public convenience and necessity to operate a passenger bus service co-ordinating with the present electric railway line, which covers approximately 8 miles. The Virginia Electric & Power Company is opposing the granting of the certificate.

Buses in Lincoln Must Load at Street Car Safety Zones

Following several months experiment of permitting the buses operated by the Lincoln Traction Company, Lincoln, Neb., to take on and discharge passengers at curb stations reserved for stops, the City Council has passed an ordinance requiring them to load and unload at the old street car safety zones. Where none of these is now marked off reservations will be made. The ordinance applies only in the congested districts and was found necessary because of the difficulties the old way added to handling traffic. This will affect 21 stops. Buses will be stopped and started on intersection signal, but traffic is permitted to pass to the right of a bus where such bus has come to a stop at a safety zone to take on or discharge passengers.

Continuance of Line in Cincinnati Won

The deluxe coach service on Reading Road, Cincinnati, Ohio, operated by the Cincinnati Street Railway, which was to have been discontinued on Oct. 1, will be continued for another month with single fares still at 25 cents, but tickets at five for \$1. In response to a questionnaire sent out by the company 79 out of 100 replies expressed satisfaction with the schedule.

Buses Succeed Cars on Pennsylvania Line

The West Penn Railways, Pittsburgh, Pa., announced on Oct. 3 that railway service connecting Oakdale, Noblestown, Sturgeon and McDonald would be abandoned with the last run on Saturday night, Oct. 15.

Bus service operated by Penn Bus Lines will begin at 5:30 a.m., Sunday, Oct. 16. It is planned that 21-passenger, city-type, Yellow coaches will be used in this operation. The same schedule service is offered as that now given by the railway cars.

Wisconsin Interurban Uses Bus

Interurban service between Plymouth and Elkhart Lake has been abandoned by the Wisconsin Power & Light Company, Madison, Wis. Bus service has been substituted. Six trips will be made daily.

Financial and Corporate

Messrs. Miller and Crosby New Directors at Oakland

Two new directors have been elected to the board of the Key System Transit Company, Oakland, Cal. The new men are Robert W. Miller, a son of C. O. G. Miller, former president of the company, and F. H. Crosby, a representative of J. Barth & Company, brokers, who now control a majority of Key System stock. Mr. Miller replaces John S. Drum, well known San Francisco banker and president of the American Trust Company, who gave the pressure of banking business as the reason for his resignation. Mr. Crosby succeeds Lester S. Ready, former president of the Key System, who resigned that office recently to become vice-chairman of the board of directors and who now has entirely severed connection with the railway.

Reorganization Plans in St. Louis Approved

The Missouri Public Service Commission on Oct. 1 announced at Jefferson City that it had approved the reorganization plans of the United Railways, St. Louis. No finding of value was made in its order, the commission merely stating that on the showing made there was sufficient property of the United Railways to justify the issuance of the securities asked by the St. Louis Public Service Company, which has purchased the railway properties. Approval of the state commission was necessary before the new company could issue its securities under the plan of reorganization.

The funded debt of the new company will include \$30,300,000 United Railways first general mortgage 4s due July 1, 1934; \$6,000,000 United Railways first general mortgage 4s, due July 1, 1934, held as collateral for \$5,000,000 short term loan; \$4,500,000 City & Suburban Public Service Company first mortgage 5s, due July 1, 1934. Grand total funded debt \$40,800,000, with annual interest charges of \$1,677,000. Stock to be issued by the company will include 73,193 shares preferred stock of St. Louis Public Service Company. This stock will bear \$7 a share cumulative dividends, or a total annual interest charge of \$512,351. Also 343,645 shares of St. Louis Public Service Company non-par common stock.

In its order the commission expressed the opinion that the reorganization plan was complete and had many commendable features, not the least of which were the substantial reductions made in the bonded indebtedness and the amounts of the annual fixed charges. Further, that it could not be doubted that the termination of the receivership and the

reorganization of the system would result in benefit both to the public and the owners of the property.

Transportation Revenues on Brooklyn City Lines Increase

For the fiscal year ended June 30, 1927, the Brooklyn City Railroad, Brooklyn, N. Y., reports gross revenues from transportation of \$11,460,584, an increase of \$61,210 compared with the previous year. Other operating revenue amounted to \$191,175, a decrease of \$87,366, the decrease being due to the cancellation of the contracts with the Brooklyn-Manhattan Transit Corporation under which it had previously leased certain of the company's car houses, shops and other properties and changes resulting from the sale of the general office building. These facts were disclosed by H. Hobart Porter, president, in the 73d annual report to the stockholders.

Operating expenses were \$9,326,056, an increase of \$362,952 compared with the previous year. Since 1919 the methods of accounting have generally followed those which were in effect at the termination of the lease. Much consideration has been given to this subject, and as of July 1, 1926, radical

INCOME STATEMENT OF THE BROOKLYN CITY RAILROAD For the Year Ended June 30

	1927	1926
Passenger revenue.....	\$11,460,569	\$11,399,283
Other car revenue.....	15	90
Total transportation revenue	\$11,460,584	\$11,399,373
Advertising and other privileges.....	99,999	96,666
Rent of land and buildings..	19,153	126,526
Rent of tracks and terminals	53,402	54,527
Sale of power.....	17,784	*
Miscellaneous revenue.....	834.7	820
Total operating revenue..	\$11,651,759	\$11,677,915
Operating Expenses		
Maintenance — Way and structures.....	\$1,361,543	\$1,327,310
Equipment.....	1,177,232	1,216,427
Power.....	1,119,829	1,047,848
Operation of cars.....	4,306,739	4,219,640
Injuries to persons and property.....	†854,157	636,747
General and miscellaneous expenses.....	506,554	515,129
Total operating expenses.	\$9,326,056	\$8,963,104
Net operating revenue....	\$2,325,702	\$2,714,810
Taxes assignable to operations.....	714,541	768,707
Operating income.....	\$1,611,161	\$1,946,103
Non-operating income.....	72,493	92,854
Gross income.....	\$1,683,654	\$2,038,958
Income Deductions		
Interest.....	\$512,492	\$500,810
Rent of cars and tracks....	25,044	79,275
Other deductions from income.....	25,529	36,135
	\$563,066	\$616,222
Net income.....	\$1,120,587	\$1,422,736

*Sale of power amounting to \$13,345 was deducted from operating expenses for the year to June 30, 1926.
†For 1927 actual expenses. For 1926 \$173,438 additional charged to casualty and insurance reserve.

changes in the accounting methods, particularly the methods of accruing the reserves for replacement of way and structures and equipment, were adopted, with the approval of the directors, so that the charges for maintenance as between 1927 and 1926, shown in the income statement, are not comparable. The cost of power shows an increase for the year of nearly \$72,000 compared with 1926. The Brooklyn City Railroad purchases its power, under a long term contract, from the Brooklyn-Manhattan Transit Corporation, the price being based on the actual cost of the power to such company. In the past year large expenditures for maintenance and repairs have been made at the Williamsburgh power plant and to this fact the increase is largely due. The operation of cars showed an increased cost of approximately \$87,000 due to a higher rate of wages paid and bonuses awarded for operation of cars without accidents referred to later.

ACCIDENT CASES HAVE BEEN REDUCED

The actual increase in the payments for injuries to persons and property over 1926 was \$43,971 as, in addition to the amount shown in the 1926 income statement, the reserve for such purpose was drawn upon during that year for \$173,438. For some years prior to 1926 there was a constant accumulation of accident cases, which during 1927 has been materially reduced.

The reduction of \$54,000 in income deductions under item of rents was due to the fact that during the early portion of the fiscal year 1926 a considerable amount was paid for rental of cars, which was later obviated by the delivery of its newly purchased cars.

The report explains the status of the proposed general and refunding mortgage plan which was denied and states that as of the date of the report the amount of the outstanding loans had been reduced from \$800,000 to \$200,000.

A proceeding instituted by the company against the receiver of the Brooklyn Heights Railroad, which has been pending for some years, to recover the net earnings of the property of the Brooklyn City Railroad between July 14 and Oct. 18, 1919, has been finally adjudicated in favor of the Brooklyn City Company, which has benefited by the receipt of a net amount approximating \$100,000.

A bonus plan was adopted on Aug. 1, 1926, under which all employees operating their cars for certain periods without an accident receive a bonus. Since this plan has been in operation the number of accidents has decreased 13 per cent.

On the subject of buses the report mentions the granting of a franchise to the Equitable Coach Company for the operation of bus lines in the Borough of Brooklyn. Many of the routes covered by the Equitable are directly competitive and parallel to the car lines of the Brooklyn City Company and Mr. Porter promises that officers and counsel will appear before the commission in opposition.

Personal Items

Thomas W. Wilson President at Wilmington

At a meeting of the board of directors of the companies held on Sept. 29 Thomas W. Wilson was elected president of the Wilmington & Philadelphia Traction Company, Wilmington, Del., and of the subsidiary railway and bus companies in both Delaware and Pennsylvania. He was also re-elected general manager. These companies recently came under the control of Stevens & Wood, Inc., through purchase of the stock of the American Electric Power Company from the American Gas & Electric Company.

Mr. Wilson was for many years associated with the International Railway, Buffalo, N. Y., first as chief engineer and for seven years as general manager. He held that position until 1912, when he removed to Wilmington, Del., to become vice-president and general manager of the Wilmington & Philadelphia Traction Company. Immediately after his graduation from Lehigh University he entered the engineering department of the Pennsylvania Steel Company. He remained there several years, leaving to become engineer of the Charleston City Railway, Charleston, S. C.

He is a member of the board of directors of the American Electric Power Company and of its various controlled companies in Delaware and Pennsylvania. He is a past-president of the New York State Railway Association and for many years has been closely identified with the American Electric Railway Association and the Pennsylvania Street Railway Association. He is also identified with many financial, commercial and social organizations in Wilmington and Philadelphia.

The new president was born in New York City in 1872. At the outbreak of the Spanish-American War he enlisted in the Eighth Pennsylvania Volunteer Infantry and served as topographical engineer of the Second Army Corps until mustered out at the end of the war.

Cedar Rapids. In Chicago their headquarters will be in the United Light financial and executive offices. No changes in personnel or management are involved in this move, the engineering and operating offices remaining in Davenport as heretofore.

F. H. Crosby Vice-President at Oakland

F. H. Crosby, who recently became a director of the Key System Transit Company, Oakland, Cal., will also serve as vice-president. He will be chief aid to President Alfred J. Lundberg. Mr. Crosby, a representative of J. Barth & Company, brokers, who now control a majority of the Key System stock, is known in the field of public utilities through his connection with a number of independent telephone companies.

"High Power" Savage Over There

The intrenchment of the American Legionnaires in the affections of Pershing, Premier and Pope is attributable in great part to the persuasive powers and winsome ways of Howard Paul Savage, a Mid-Western railway man. Mid trumpets and torches, shouts and songs, he and his buddies are marching through Europe renewing friendships at Armentières and bowing reverential heads in Flanders Fields. When he communes appealingly with the dead at Suresnes or issues orders for furloughs in Montmartre, one wonders whether this American son of toil is making history for the American Legion or whether the Legion is making history for its retiring commander. For in this genial, gray-haired, 42-year old member of the American Expeditionary Forces is another fulfillment of dreams dreamed in the land of promise. Even the most visionary would never have seen in the young man who entered electric railway work in 1913 on the Metropolitan West Side Elevated Railroad of Chicago as track foreman an important factor in re-establishing and restoring friendly relations between the old and the new worlds.

Late in 1926 "High Power" Savage, as he was affectionately known on the "L," was made assistant general manager of the Chicago, North Shore & Milwaukee Railroad at the same time that John F. Egolf was made general manager. He had been serving the Chicago Rapid Transit Company as general superintendent of maintenance of way following a promotion from the position of track engineer.

With the outbreak of the war he secured a leave of absence and obtained a commission in the 55th Engineers, serving in France from July, 1918, until

July, 1919. On his return to civil life he resumed his position with the Rapid Transit Lines in accordance with the policy of all utilities under the management of Samuel Insull and associates. Immediately on his return he formed Chicago Elevated Post, No. 184. He was the first commander of that post and was a post state commander of Illinois. Conspicuous among his achievements in Legion affairs have been his activities in securing the soldiers' bonus, in increasing Legion membership and in planning a sound financial basis for all posts. It was because of his tireless efforts and notable accomplishments for that organization that the great honor of national commander was conferred upon him at the annual convention of the American Legion on Oct. 15, 1926, in Philadelphia. When he returned to Chicago a mighty throng turned out to meet him. There will no doubt be a vast crowd to meet him when he returns to America, greater in number and louder in acclaim than the greeting he received in Chicago a year ago. At that time Bernard J. Fallon, vice-president of the Chicago Rapid Transit Company and official spokesman of the occasion, called Col. Savage "a credit to Chicago and a credit to the nation, the type of man Chicago needs." The spokesman for the coming occasion can do no better than reiterate these sentiments.

May the diamond-studded gold key to the Hotel des Nations Americaines be his perpetual passport to the countries of Europe and may the cross of the federation bestowed upon him in Brussels motivate him in "carrying on" for the North Shore road and for his stalwart buddies.

William H. Hodge, Vice-President of Byllesby Engineering

"The father of customer-ownership," William H. Hodge, has been elected a vice-president of Byllesby Engineering & Management Corporation and appointed a manager of a newly created sales and advertising department of that company at its Chicago headquarters. The sales and advertising department will have general charge of the development of new business and advertising at all of the Byllesby utility properties, which now compose one of the larger groups of these enterprises under unified management in the United States.

Mr. Hodge has been connected with the Byllesby organization since 1910 as manager of the advertising and publicity department. He had a prominent part in the development of the customer-ownership plan of financing by utility companies and in their public relations and commercial activities.

GEORGE J. BAKER, superintendent of the Buffalo & Erie Railway, Fredonia, N. Y., was made general manager on Oct. 1. He entered the service of the Buffalo & Lake Erie Traction Company, the predecessor of the Buffalo & Erie Railway, in 1902 as a conductor on the city lines in Buffalo.

Messrs. Denman and Chamberlain Removed to Chicago

J. Denman, president of the Tri-City Railway & Light Company, and his assistant, W. I. Brown, are moving their headquarters from Davenport, Iowa, to Chicago, Ill. William Chamberlain, vice-president and general counsel of the United Light & Power Company, which controls the United Light & Railways, will also move to Chicago with Assistant Humphrey. May points, both east and west, which Messrs. Denman and Chamberlain must visit frequently are more accessible from Chicago than from Davenport or

Manufactures and the Markets

Platform Adopted by National Association of Manufacturers

Seventy-five members of the Platform of the Platform of American Industry Committee, called together by the National Association of Manufacturers, met recently in the Waldorf-Astoria Hotel, New York, and adopted the following fourteen planks for incorporation in the national platform to be submitted to both the Republican and Democratic parties next year. The planks are as follows: Government and business, taxation, regulation of combinations, employment relations, transportation, immigration and naturalization, international relations, tariff, foreign trade policies, merchant marine, Federal Reserve Bank system, waterways development, flood control and agriculture.

The fourteen planks will be drawn up by as many sub-committees working under a general drafting committee of eleven men from various parts of the country. The fourteen subcommittees will be appointed in the next fortnight. John E. Edgerton, president of the National Association of Manufacturers, was chosen chairman of the general committee. The drafting committees will shape up the various planks and report their conclusions at the annual convention of the manufacturers to be held in Chattanooga, Tenn., October 25, 26 and 27.

Secretary Davis Misunderstood on Indiana Coal Situation

The bituminous coal strike was discussed by President Coolidge and his advisers Sept. 13 at the first Cabinet meeting to be held following the return of the Chief Executive from South Dakota. The verbal statement of this discussion was misinterpreted by some of the daily newspapers into an announcement that went beyond the facts stated. It was stated verbally at the White House, following the Cabinet meeting,

that Secretary of Labor Davis had reported to the President that developments in Illinois indicate a "strong probability" of the strike being settled in that state soon. It also was stated that the Secretary had reported 55 per cent of the mines of Indiana operating under the old Jacksonville agreement, which was interpreted as meaning that the strike was "55 per cent settled in Indiana." The President was informed, it is understood, that there is a large tonnage of bituminous coal above ground, which would indicate no danger of a shortage of supply, and that there is nothing in the soft coal price situation to indicate a shortage of supply.

Huge Storage Battery Switching Locomotive

State Line Generating Company, Hammond, Ind., has just placed in service the largest storage battery locomotive in the world. It is capable of pulling a 1,500-ton train and its total weight is 100 tons.

The locomotive, built by the General Electric and the Electric Storage Battery Companies, has all the advantages of an electric locomotive, but does not require an overhead trolley or third rail for its power. The manufacturers claim that it is noiseless and smokeless in operation and can accelerate quicker and move a heavy load much faster than other types of switching locomotives. Its huge storage battery, weighing 39 tons, the largest ever manufactured for this purpose, will deliver 1,000 hp. to the driving motors. This power is equivalent to 1,579 six-volt batteries such as used for radio purposes, or is sufficient to crank 1,600 automobiles simultaneously. A motor-generator set installed in the cab will permit the charging of the battery from a 2,300-volt circuit in the plant.

Westinghouse Awards War Memorial Scholarship

Awards were recently made to two Pittsburgh and two New York boys in the 1927 War Memorial Scholarship of the Westinghouse Electric & Manufacturing Company. The scholarships, established in memory of the Westinghouse employees who lost their lives in the World War, carry a fund of \$500 a year and are good for a period of four years.

The winners in the 1927 contest were: H. L. Bunker, Jr., son of H. L. Bunker, rate setter, East Pittsburgh Works; P. J. Glaister, tester, East Pittsburgh Works; M. T. Ayres, son of M. C. Ayres, foreman of dial markers, Newark Works, and A. L. Kine, son of R. R. Kine, salesman, New York

office. Successful contestants were selected on a basis of mental, physical and social activities.

Ten Semi-Steel Cars Being Built for Boston Elevated

The ten cars ordered by the Boston Elevated Railway, Boston, Mass., on Aug. 3 from the Laconia Car Company, Laconia, N. H., as announced in the Aug. 20 issue of the JOURNAL, are to be delivered during the 40-day period between Dec. 1, 1927, and Jan. 10, 1928. They are to be placed in service in South Boston and will replace the old box cars now in use there.

The cars, with a seating capacity of 48, are being built at a cost of approximately \$12,000 each. They are of the one-man, two-man, double-end, double-truck type, having a total weight of 31,460 lb. and a length over all of 45 ft. 0 in. The body is of semi-steel construction with end doors and has an arch roof. The seating arrangement includes four longitudinal and sixteen cross seats, with a spacing of 29½ in. The painting scheme is to be yellow.

Operating equipment includes four G.E. 264-A inside-hung motors, G.E. K-71 control and Westinghouse air brakes with variable load attachment.

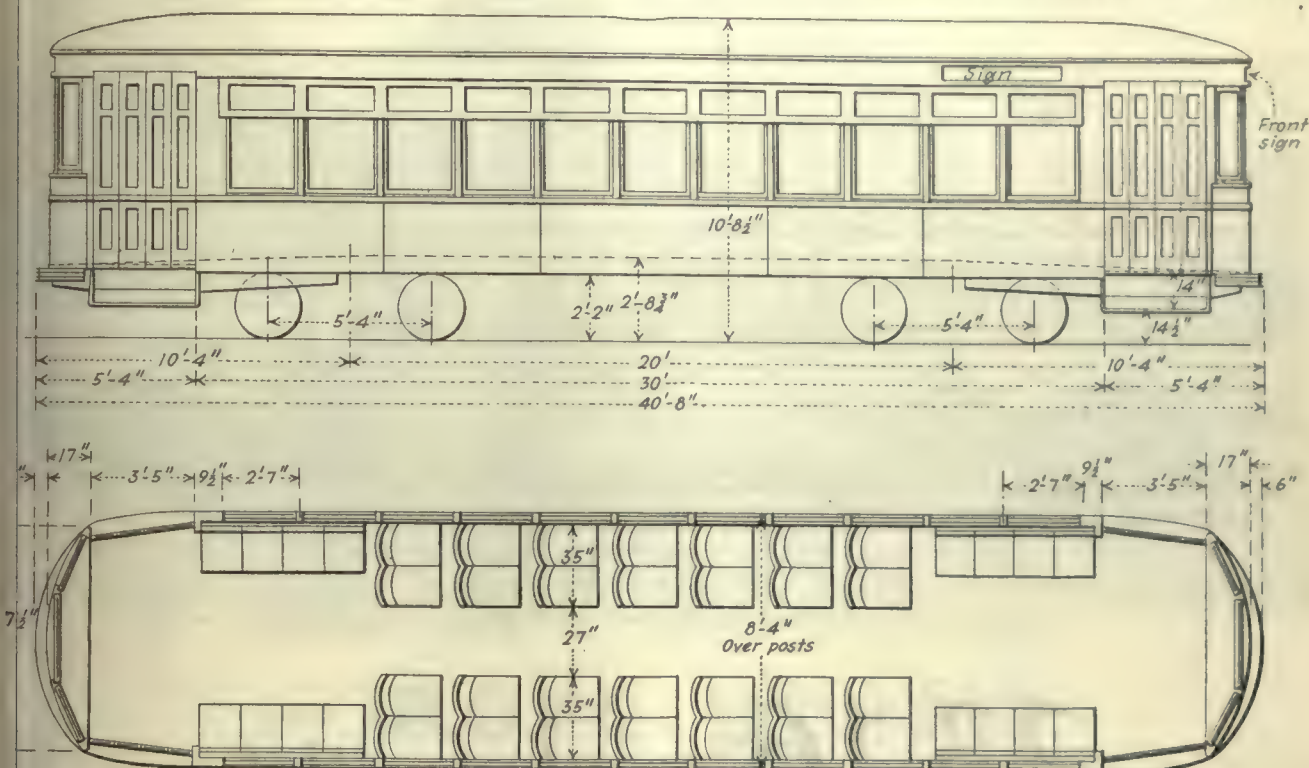
The official specifications are as follows:

No. of units.....	10
Type of unit.....	One-man, two-man, motor, passenger, city, double end, double truck
Seating capacity.....	48
Builder of car body.....	Laconia Car Company
Date of order.....	August 3, 1927
Date of delivery.....	Dec. 1, 1927, to Jan. 10, 1928
Weights:	
Car body.....	13,800 lb.
Trucks.....	8,700 lb.
Equipment.....	8,960 lb.
Total.....	31,460 lb.
Bolster centers.....	20 ft. 9 in.
Length over all.....	45 ft. 0 in.
Length over body posts.....	30 ft. 11½ in.
Truck wheelbase.....	5 ft. 2 in.
Width over all.....	8 ft. 6½ in.
Height, rail to trolley base.....	10 ft. 7½ in.
Window posts spacing.....	31½ in.
Body.....	Semi-steel
Roof.....	Arch
Doors.....	End, folding
Air brakes.....	Westinghouse, variable load attachment
Armature bearings.....	Plain
Axles.....	Pittsburgh Forge & Iron Company
Compressors.....	DH-46
Conduit.....	Flexible
Control.....	General Electric K-71
Couplers.....	Malleable iron sleeve
Destination signs.....	Keystone
Door mechanism.....	National Pneumatic Company
Energy-saving device.....	Railway Improvement Co.
Fare boxes.....	Johnson
Finish.....	Flood-Conklin
Floor covering.....	Wood
Gears and pinions.....	General Electric spur
Glass.....	Double thick
Hand brakes.....	National stainless
Hand straps.....	Rice
Heat insulating material.....	Salamander
Heaters.....	Consolidated Car Heating Company
Headlights.....	Dersaw
Headlining.....	Bronze and malleable iron
Journal bearings.....	Plain
Journal boxes.....	Steel castings
Lamp fixtures.....	Weber No. 61000
Motors.....	Four General Electric 26-A, inside hung
Registers.....	International single
Roof material.....	Wood and canvas
Seats.....	J. G. Brill Co.—4 longitudinal
Seat spacing.....	29½ in.
Seating material.....	Wood and canvas
Slack adjusters.....	M-1
Steps.....	Folding
Step treads.....	Wood universal tread nosing
Trolley catchers.....	Earl
Trolley base.....	Ohio Brass
Trucks.....	Taylor, type LRB
Ventilators.....	Garland
Wheels, type.....	Steel, 26-in. diameter
Wheelguards.....	Wood life guards on trucks

METAL, COAL AND MATERIAL PRICES F. O. B. REFINERY

Metals—New York	Oct. 4, 1927
Copper, electrolytic, cents per lb.....	12.90
Copper wire, cents per lb.....	15.25
Lead, cents per lb.....	6.25
Zinc, cents per lb.....	6.00
Tin, Straits, cents per lb.....	59.50
Bituminous Coal, f.o.b. Mines	
Smokeless mine run, f.o.b. vessel, Hampton Roads, gross tons.....	\$4.75
Somerset mine run, Boston, net tons.....	1.80
Pittsburgh mine run, Pittsburgh, net tons.....	1.95
Franklin, Ill., screenings, Chicago, net tons.....	1.875
Central, Ill., screenings, Chicago, net tons.....	1.625
Kansas screenings, Kansas City, net tons.....	2.70
Materials	
Rubber-covered wire, N. Y., No. 14, per 1,000 ft.....	\$5.55
Weatherproof wire base, N. Y., cents per lb.....	5.20-5.70
Cement, Chicago net prices, without bags.....	2.05
Lined oil (5-bbl. lots), N. Y., cents per lb.....	11.2
White lead in oil (100-lb. keg), N. Y., cents per lb.....	13.75
Tar-pentine (bbl. lots), N. Y., per gal.....	\$39.0

50 More for Montreal!



Fifty units of this type are now being built for the Montreal Tramways by the Canadian Car & Foundry Company. Delivery is expected in September. Aluminum alloy will figure largely in their construction.

There will shortly be delivered to the Montreal Tramways fifty new two-man, city type, single-end cars equipped with

"Peacock" Staffless Brakes

Reg. U. S. Pat. Off.

Only last year this company placed in service a like number of new cars, similarly equipped. These new cars, weighing 36,000 lbs. and built by the Canadian Car & Foundry Co., seat 44 passengers—the last word in modern car design.

May we tell you why this Company, and nearly all the purchasers of new cars in Canada and the United States, repeatedly specify "Peacock" Staffless Brakes? Their many advantages are a revelation to new users and the reliable standby of properties that have once used them. Write today.



The
"Peacock"
Staffless

National Brake Company, Inc.

890 Ellicott Square, Buffalo, N. Y.

Canadian Representative

Lyman Tube & Supply Co., Ltd., Montreal, Can.

Safeway Six-Wheelers on Cumberland Lines show high mileage with low operating costs



23.16 *per bus mile!*

Operating cost per bus mile

	Cents
Superintendence of Plant and Equipment..	0.42
Maintenance (body and chassis).....	3.86
Tires and tubes.....	1.46
Fuel	2.36
Lubricants	0.26
Garage supplies and expenses.....	0.85
Superintendence of Transportation.....	0.28
Driver's wages	2.98
Street men and inspectors.....	0.40
Transportation expenses.....	0.94
Ferries and tolls.....	1.29
Printing and advertising.....	0.37
Depreciation	3.06
General office expense and salaries..	0.67
Other general expenses	0.11
Rent of rolling stock.....	1.27
Insurance	1.44
Taxes and interest.....	1.14
Total cents	23.16

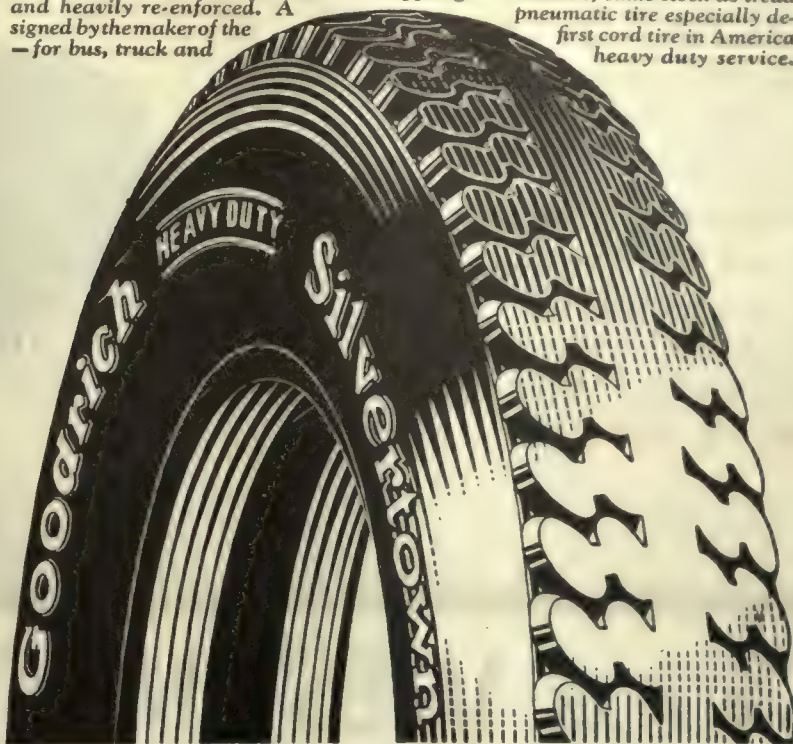
IN this South Jersey operation Six-Wheelers on certain runs are averaging over 350 miles per day—or 100,000 miles per year per bus. Seven vehicles have operated 200,000 miles each. And three repeat orders from this company is further proof of the ability of Safeway Six-Wheelers to deliver high continuous mileage at low operating cost.

THE SAFEWAY SIX-WHEELER

THE SIX WHEEL COMPANY, 1800 W. LEHIGH AVENUE, PHILADELPHIA, PA.

Manufacturers of De Luxe, City, and Double Deck Type Six-Wheel Coaches

Super dimensions—special rubber compound. Extra tough, heavy duty, anti-skid tread. Long-wearing, "non-rippling." Sidewalls, same stock as tread and heavily re-enforced. A pneumatic tire especially designed by the maker of the first cord tire in America—
—for bus, truck and heavy duty service.



— more profit than you think!

The whole matter of using tires on buses is a matter of profit. Without them—no profit is possible. With them—profits depend upon the tires you use.

Goodrich Heavy Duty Silvertowns bring profits at every turn. Profits from savings in mileage costs. Profits from reduction in tire-changing delays. Profits from the reputation for promptness which they help to build for the bus lines which use them.

THE B. F. GOODRICH RUBBER COMPANY, Established 1870, Akron, Ohio
In Canada: Canadian Goodrich Company, Kitchener, Ontario

Goodrich

HEAVY DUTY Silvertowns

HIGH PRESSURE OR BALLOON

AIR—and air *alone* can absorb and thus practically eliminate road shocks and vibration.

These two destructive forces cost truck and bus operators who ignore them hundreds of thousands of dollars every year in unnecessary maintenance expense and repair bills—



GRÜSS
Sleeve Type
AIR SPRING



WESTINGHOUSE
Piston Type
AIR SPRING

THE SHOCK ELIMINATORS FOR TRUCKS-BUSSES-PASSENGER CARS



AIR Springs float the bus or truck chassis on cushions of air. These air cushions absorb road shocks and vibration, prevent twisting and wrenching of frame, eliminate shifting of load and damage to cargo, insure supreme riding comfort regardless of road conditions.

Thousands of truck and bus operators in all parts of the world have found the savings thus effected make air springs the greatest dividend payer they have in connection with their equipment.

The CLEVELAND PNEUMATIC TOOL COMPANY
Cleveland, Ohio



The LATEST
in **MOTOR COACHES**

---and, Operators say, the

MOST PRACTICAL

Popularity Proved



6 *Cylinder Engine* **4** *Speed Transmission* **4** *Wheel Brakes*
(Lockheed Hydraulic)

GRAHAM MOTOR

SOLD BY DODGE BROTHERS

by **M**ounting **S**ales

Graham Brothers 6-cylinder motor coaches win immediate favor—operators express their enthusiasm most convincingly by buying them

Wherever Graham Brothers 6-cylinder motor coaches have been shown the reception accorded them has been most enthusiastic. They have attained instant popularity with operators and public alike.

Numerous orders are being received from present operators of the 4-cylinder coaches. So satisfactory and profitable has been their experience with Graham Brothers equipment that they are buying the new coaches with complete confidence.

Those already in service are delighting owners with the smooth, flexible, abundant power from the new 6-cylinder engine—with the operating advantages of the 4-speed transmission, with the 4-wheel brakes (Lockheed Hydraulic) and the riding ease afforded by the 3-stage progressive type springs. They are showing a low operating cost.

Operators are saying of this new coach —“everything a motor coach should be or have.”

\$4045 \$4060 \$4290

12-Passenger
Parlor Coach
(f. o. b. Detroit)

21-Passenger
Street Car Type
(f. o. b. Detroit)

16-Passenger
Parlor Coach
(f. o. b. Detroit)

BROTHERS COACHES

SALES EVERYWHERE

COMPLETE UNIT

Purchasers of Graham Brothers Motor Coaches get the complete unit—chassis and body—from one source. There is no division of responsibility.

The complete coach is built by Graham Brothers—assurance of fine materials and workmanship and correctness of design and engineering.

The complete coach is sold by Dodge Brothers Dealers—saving the purchaser time and money and eliminating the confusion attendant upon scattered buying.

The complete coach is serviced by Dodge Brothers Dealers—everywhere.

GRAHAM BROTHERS

Evansville — **DETROIT** — Stockholm
A DIVISION OF DODGE BROTHERS, INC.
GRAHAM BROTHERS (CANADA) LIMITED—TORONTO, ONTARIO

Operators everywhere are swinging to the General *Heavy Duty Cushion Tire* because of freedom from Blowout, Breakdown and Base Separation, which is by far the biggest factor in economy of tire operation.



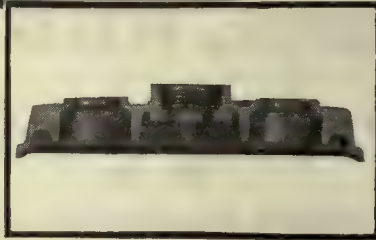
—better buy
Generals NOW
than buy and buy

The
GENERAL
TIRE

—goes a long way to make friends

BUILT IN AKRON, OHIO, BY THE GENERAL TIRE AND RUBBER CO.

Think of MILEAGE when you
pick your batteries



High-quality rubber jars and covers — and semi-soft sealing compound to keep everything tight. The result is that Willard jars and covers come through mile after mile of rough going, perfectly sealed and doing their share toward uninterrupted battery service. Even sudden temperature changes won't affect Willard sealing compound.

WILLARD STORAGE BATTERY CO.
CLEVELAND, OHIO

Whatever stops a bus from
making miles stops that bus
from making money. And even
the slightest crack in the
battery case, or the slight-
est imperfection in the seal
between battery jars and
covers, may be the cause of
lost mileage -- lost profits
-- lost good will.

F.A. Willard

Willard Batteries



Is sheer cut beauty belies its **STRENGTH**

A beautiful job.

There's no other way to describe it. From cowl to rear bumper, from front step to rear seat, exterior and interior—the Fitzjohn body is as inviting as the costliest limousine and as comfortable.

Passengers sense this. Small wonder then that Fitzjohn bodies not only draw passengers, but help build up profitable bus operation.

To the operator, Fitzjohn offers a bus body of enduring strength and maximum bus hours in

service, under road, weather or traffic conditions at their worst.

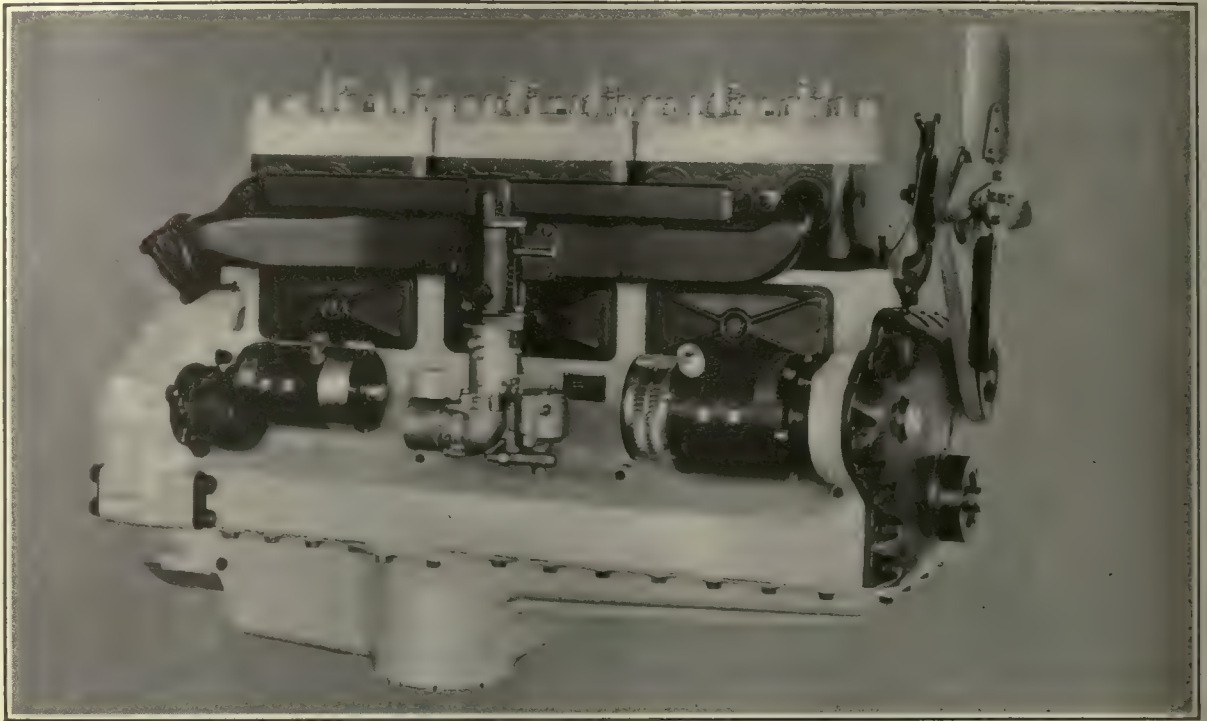
And in beauty of coach work, Fitzjohn presents a finish which in durability matches the ruggedness of construction of floor, framework, roofing and siding.

Specify Fitzjohn bodies, city or de luxe type, for any chassis in your next bus order. The same enduring strength and beauty is inherent in every job.

Fitzjohn

MANUFACTURING COMPANY

Muskegon, Michigan



There's Always a "Kick" in the Battery!

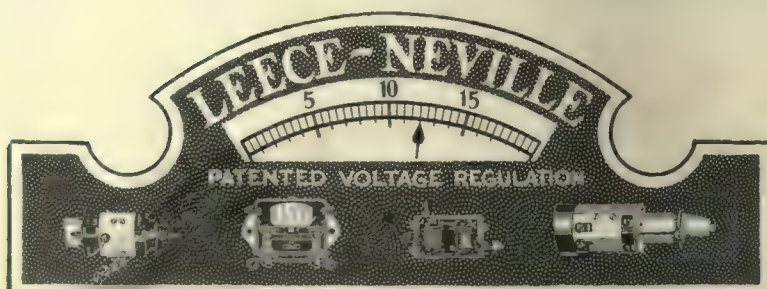
So
Waukesha Uses
LEECE-NEVILLE
Patented Voltage Regulation

Starting and lighting worries cease to exist when motor coaches are equipped with Leece-Neville Patented Voltage Regulation. There's always a "kick" in the battery!

Correctly charged for all conditions, Leece-Neville equipped batteries thrive on hard work. Records of 125,000 miles without removal for repair are not unusual.

Long life is inherent in batteries hooked up with Leece-Neville Patented Voltage Regulators. Motors start readily under severest service. Lights burn brightly and steadily at all times.

That's why manufacturers of the better motors and motor coaches specify Leece-Neville Patented Voltage Regulation as standard equipment.



THE LEECE-NEVILLE
COMPANY
5353 Hamilton Ave.
Cleveland, Ohio

Every year,
at the Show, you can
find somebody's idea of
a better dual wheel
- - - but every year,
at the Showdown, you
find only Budd-Michelin



BUDD

WHEEL COMPANY, Detroit



The Brooklyn City Railroad Company uses a fleet of 19 White Trucks in construction and maintenance work.

First Place in Electric Railway Construction and Maintenance Service

Construction and maintenance is a vital part of Electric Railway operation. For years White Trucks have been the outstanding choice of Electric Railways in every section of the country.

Dependability of service and economy of operation are responsible for the fact that, today, over 200 Electric Railways are using White Trucks in a wide variety of service.

White's position of leadership in the Electric Railway Field is due primarily to its long record of efficient, economical and dependable service. Added to this is the quick adaptability of White Trucks to every kind of construction and maintenance work that has made them an indispensable part of Electric Railway operation.

51 Electric Railways operate 2,109 Whites in fleets of 10 or more

American Power and Light Company.....	42	Los Angeles Railway Corporation.....	22	Rio de Janeiro Tramway, Light and Power Co.....	10
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THE WHITE COMPANY, Cleveland

WHITE TRUCKS

and WHITE BUSES

"Richmond Service Is Good"

Use 93 Whites in Unified System



*One of a fleet of 93 White Busses in the Service
of the Virginia Electric and Power Company*

THE Virginia Electric and Power Company, in co-ordinating bus and rail transportation, advertises, and justly so, that "Richmond Service is Good." By acquiring numerous independent bus lines, coupled with the purchase of a large amount of new equipment, the company has put into effect a complete plan of transportation unification in the cities of Richmond, Norfolk, Petersburg and Portsmouth. Together with other equipment, 93 White Busses are used.

In projecting its unified bus and rail transportation system the company was convinced that motor busses are an essential part of city and intercity transportation; that both electric cars and busses can and should help and supplement the other.

The company's cars and busses during 1927 will carry more than 100,000,000 passengers. Nearly 1,000,000 passengers were carried by bus alone in Norfolk the first month under the reorganization plan.

Busses are considered invaluable because of the

help they render in the development of suburban areas and in augmenting city service. They are flexible and permit additions or changes in accordance with their capacity for developing profitable operations. Unified transportation is looked upon as a form of insurance on original investment.

The Virginia Electric and Power is one of numerous companies that have found White Bus operation profitable. White Busses and Trucks are used by hundreds of independent operators and by more than 200 steam and electric railroads.

THE WHITE COMPANY, *Cleveland*

WHITE BUSES

FOURS AND SIXES

At the Convention—



you saw
them all—

now
buy your choice

MASSACHUSETTS MOHAIR PLUSH

The railroad standard for over 35 years

You saw all the various materials for modern car upholstery at the Convention. Now you know that you can't do better than plush!

Passengers riding on plush are supported on myriads of little springs

—the utmost in ease and luxury. Furthermore, the newest patterns and colorings provide all you could want in luxurious practical upholstery for every type of service. Specify Plush in your next order.

Quotations and samples on request.

MASSACHUSETTS MOHAIR PLUSH CO.

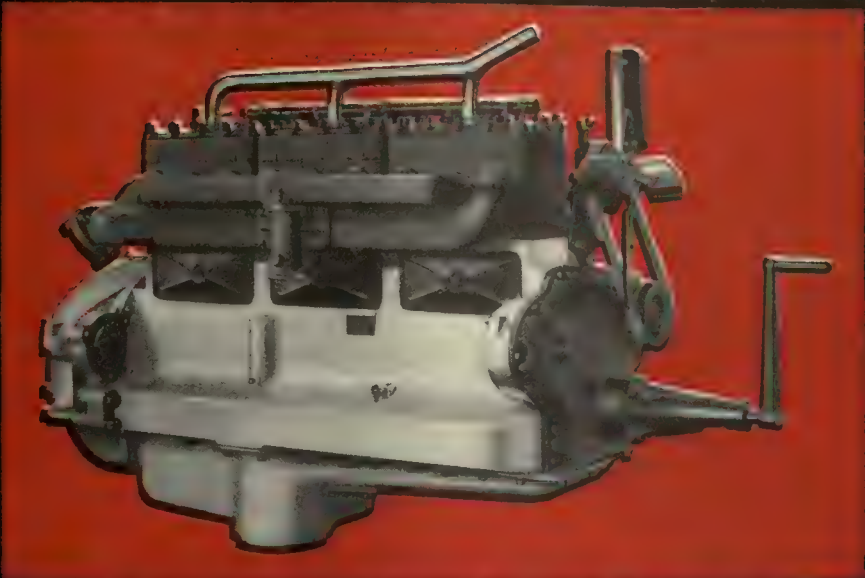
Main Office: 80 Federal Street, Boston, Mass.

Makers of BAY STATE PLUSH

New York Agent:
Sisson Supply Co.
1845 Grand Central Terminal,
New York City

Western Agent:
Midgley & Borrowdale
1823 McCormick Building
Chicago, Illinois

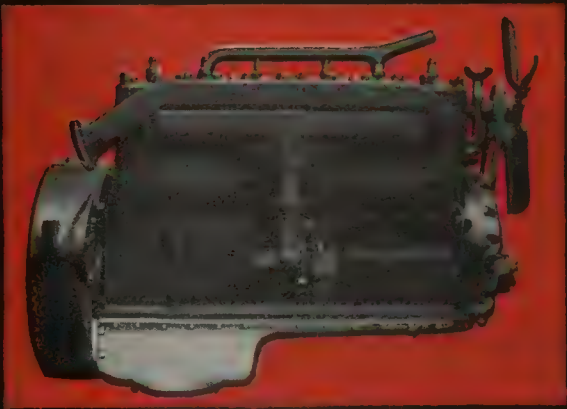
Models "6-AB," "6-HB" and "6-QB"



Heavy Duty Waukesha Six Cylinder Bus engine built in three sizes, 80, 100 and 120 Horsepower. Used in such parlor coaches as Versare, C. H. Will and Fageol. Described in Bulletin No. 592.

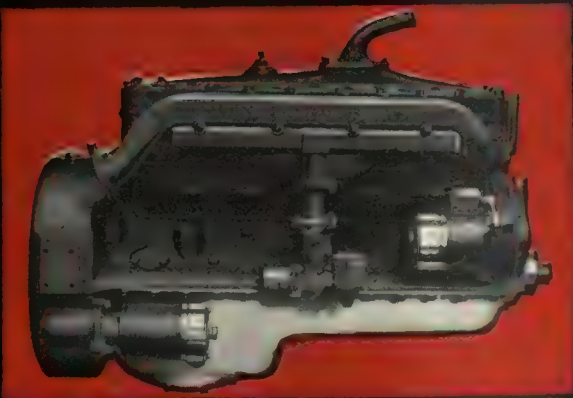
Model "6-KS"

This is an intermediate size of Waukesha Heavy Duty Six Cylinder engines, developing 75 horsepower and suitable for parlor coaches up to 18 or 20 passenger capacity such as built by Fageol. Described in Bulletin No. 628.



Model "6-XL"

For the "Twin Coach" two of these specially designed 50 horsepower six cylinder Waukesha engines of this type are used. Full description in Bulletin No. 625.



To those who did not see these engines at the A. R. E. A. Convention, we will be pleased to forward any of these Bulletins in which you are interested.

A-765-LC

AUTOMOTIVE EQUIPMENT DIVISION

WAUKESHA MOTOR COMPANY
Waukesha (Eastern Sales Offices: Eight W. 40th St., New York City) Wisconsin

Exclusive Builders of Heavy Duty Automotive Type Engines for Over Twenty Years

Comfortable seats

—and H & K Seats provide



No. 900-D

No. 900-D—all leather double stationary chair with deep individual seat cushions and divided back. For buses and interurban cars.

No. 900-D—double chair without arm rest. For city type cars.

No. 392-A—double Walkover seat with divided spring edge back and double deck spring edge cushion. For city service.

No. 392-A—double Walkover seat with plain spring back and double deck spring edge cushion. For city type cars.

No. 392-EE—finest type Walkover seat with extra high three part head-roll. For interurban service.

No. 900-D—combination plush and leather double stationary chair with deep individual seat cushions and divided back. For buses and interurban cars.

H & K seats are made in types and styles for every class of service.

Send for the H & K Catalog to get complete descriptions.



No. 900-D
(without armrest)



No. 392-A
(with divided cushion and back)

Hale and
Kilburn

SEATS

have rider appeal

most comfort in every type of service

EVERY day it becomes more apparent that if electric railways are to compete on an equal basis with other forms of transportation, they must provide service that has *rider appeal*. And there's no stronger appeal than luxuriously comfortable seats.

Hale & Kilburn Seats are designed primarily to provide this passenger comfort. But they are also strong, durable and graceful—a distinct asset in selling a service to the public.

They are the result of more than fifty years of seat building experience applied to the seat problems of the modern electric railway car.

One of our representatives will be glad to consult with you at your convenience.

HALE & KILBURN COMPANY

General Offices and Works:

1800 Lehigh Avenue, Philadelphia

SALES OFFICES:

Hale & Kilburn Co., 30 Church St., New York.
Hale & Kilburn Co., McCormick Bldg., Chicago.
E. J. Thornwell, Candler Bldg., Atlanta.
F. Bodier, 903 Monadnock Bldg.,
San Francisco

T. C. Coleman & Son, Starks Bldg., Louisville
W. L. Jefferies, Jr., Mutual Bldg., Richmond
W. D. Jenkins, Praetorian Bldg., Dallas, Texas
H. M. Euler, 46 Front St., Portland, Oregon



No. 900-D



No. 392-EE



No. 392-A
(with plain cushion and back)

Hale and Kilburn SEATS

Cincinnati is using "Globe" transfers



THE Cincinnati Street Railway Company operates 48 lines of street cars and coaches, with inter-transfer.

To facilitate the rapid movement of passengers and to guard against abuses of transfer privileges, the Company adopted the Globe P. M. Coupon feature.

"Globe P. M. Transfers" simplify and insure proper fare-collection to the fullest possible extent by their safeguards against round-tripping.

Our representative will co-operate with you in working out your specific problems.

Specialists
for half a
century

Globe

TICKET COMPANY

112 North Twelfth Street
PHILADELPHIA

NEW YORK BOSTON BALTIMORE CLEVELAND LOS ANGELES

The MOTORTRUCK JACK

for Heavy Trucks
and Fleets

Lifts
Load and all
an easy one-man job



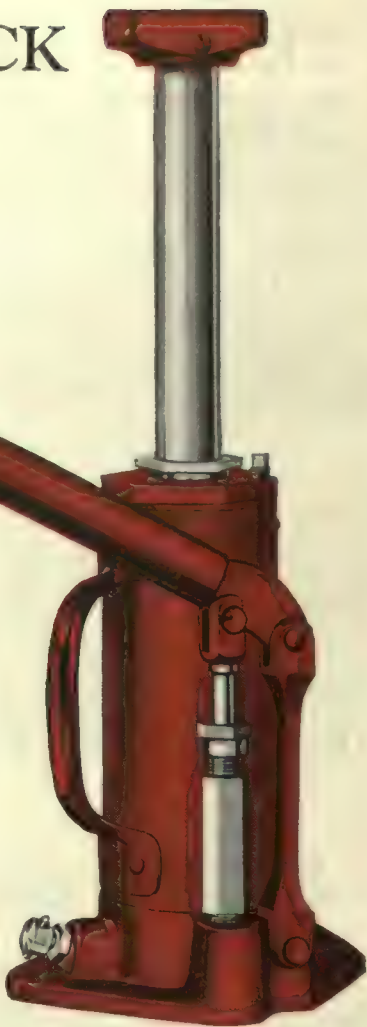
ONE tire change without removing the load, pays for the Blackhawk "Motortruck"—a sturdy, rugged jack built for years of hard work. Earns its cost, repeatedly, in time-saving, dependable service.

Lifting the most heavily loaded, giant-sized truck is an easy one-man job. The 7-ton or 12-ton Motortruck Jack is low enough to go under any truck when tire is flat. It lifts high enough to put on the inflated spare easily.

Any length handle stroke raises the load. Lowering is automatic—turning release valve with handle lowers load without pumping. Operator controls the speed. The whole job is one-man capacity—and absolutely safe.

Details and prices of the complete Blackhawk line (1½ to 60 tons capacity), and list of important truck and fleet owners using Blackhawk Jacks, will be gladly sent to you.

BLACKHAWK MFG. CO.
Dept. E. U., Milwaukee, Wisconsin



The "Motortruck"
3 models, lifting from 9-in. to 14 ½-in.,
11-in. to 17 ½-in., 11-in. to 18-in.
heights

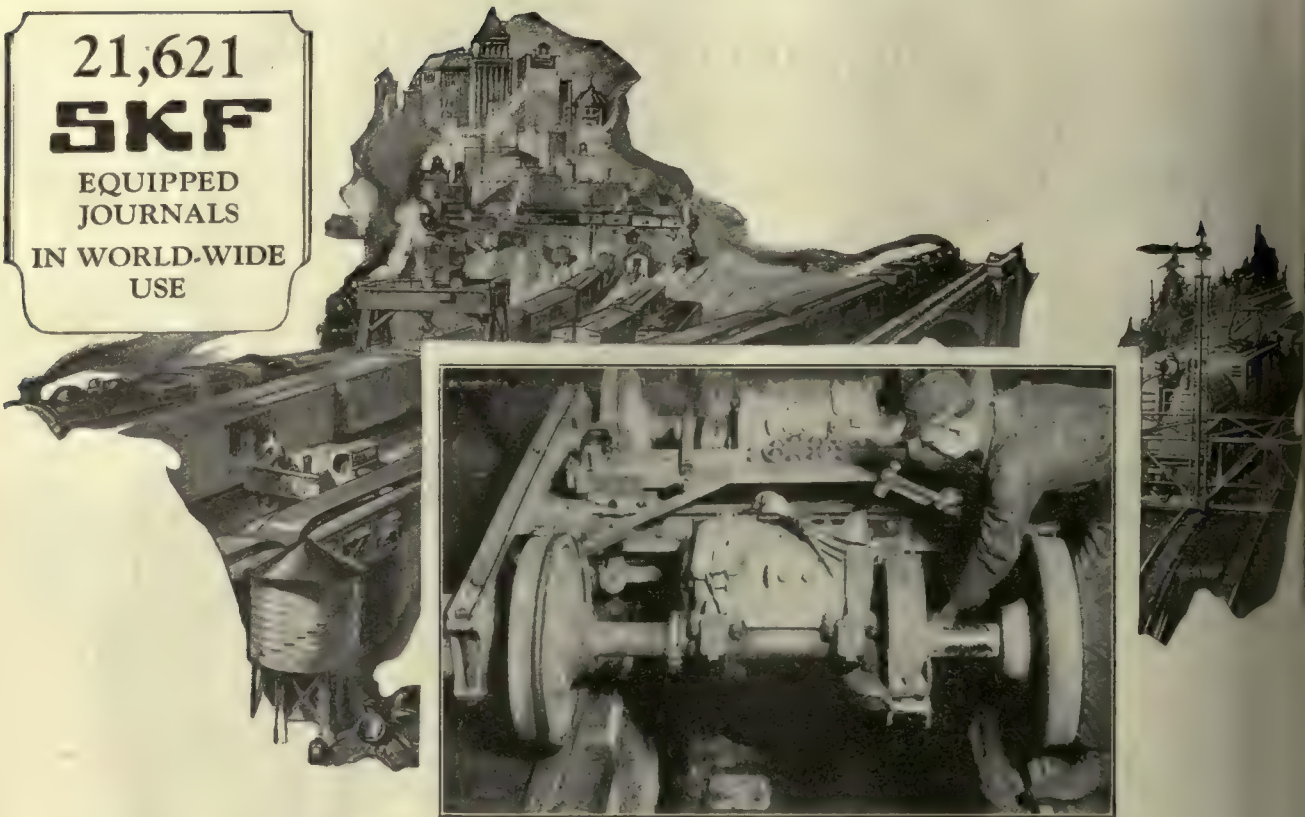


The "Motorcoach"
for busses and speed delivery fleets, lifts
seven tons. Can be placed under low
chassis for tire changes. Collapsed 8 ½-
in. high. Extended 16 ½ in. high. Short
strokes and long handle permit easy op-
eration by one man, regardless of over-
hang or platform. Neither passengers
nor load need ever be disturbed.

BLACKHAWK JACKS HYDRAULIC OIL-POWER

21,621
SKF

EQUIPPED
JOURNALS
IN WORLD-WIDE
USE



SKF-Equipped Journals and Motors Please Public and Save for Management

"THE public be pleased" plus material operating advantages and economies are valid reasons why leading street railway companies are adopting **SKF** Journal Bearings for trucks and **SKF** Ball and Spherical Bearings for electric motors.

Thousands of miles of service have proved the long-life and ruggedness of

SKF Bearings. Shock loads, thrusts from rough or uneven track, these have little effect on the easy running qualities of **SKF** Bearings. On motors, they maintain original clearances, initial efficiency and reduce electrical troubles to a minimum. Misalignment of pinions and noisy gears are also eliminated.

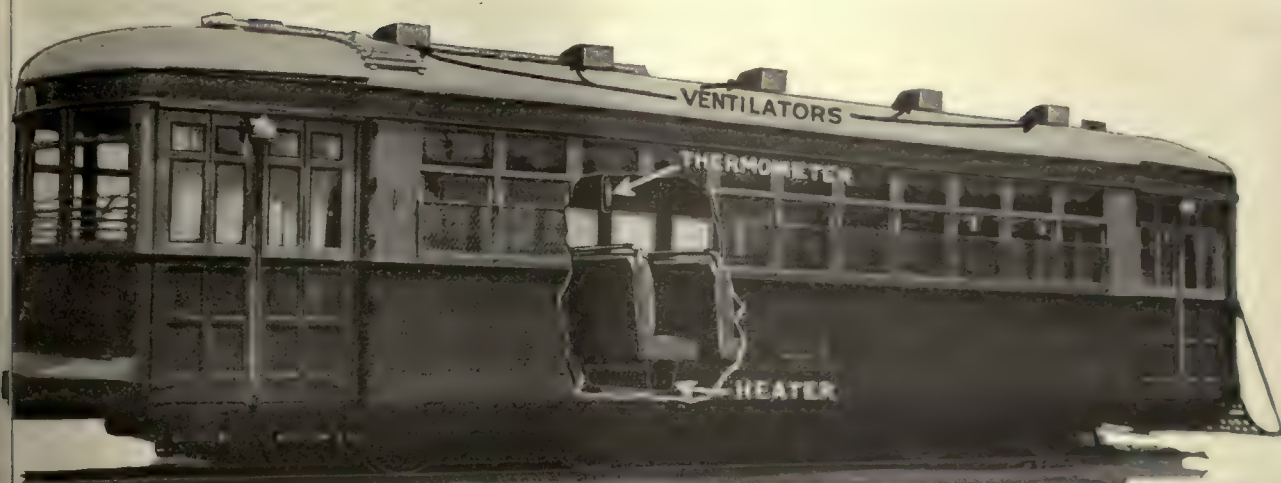
SKF INDUSTRIES, INCORPORATED, 40 East 34th Street, New York N. Y.

1906



**Ball
Bearings**

**Roller
Bearings**



Railway Utility Equips 715 Cars at Kansas City

The Kansas City Public Service Company has gone a long way to insure comfort for its riding public in the rehabilitation schedule on 715 of its cars. Among other equipment specified for the modernizing of its cars are:

*Utility Compensating System
of Natural Ventilation*

*Utility Thermometer Control
of Car Temperature*

Utility Electric Car Heaters

Let us figure with you on your requirements, either for new equipment or for modernizing the existing facilities.

Address nearest office:

Railway Utility Company

2241 Indiana Avenue, Chicago

Branch Offices: New York, Detroit, Denver
St. Louis, Montreal



Intake
Ventilator

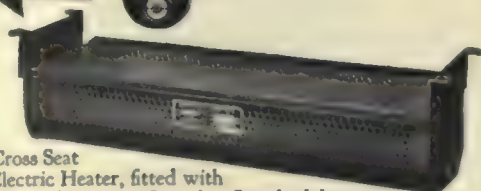
Compensating System of Natural
Ventilation keeps the air in the
car pure and wholesome



Exhaust
Ventilator



Thermometer Control
keeps the air in the
car at uniform temper-
ature, avoids spread
of contagious disease
by preventing over-
heating of car.



Cross Seat
Electric Heater, fitted with
Chromalox Strips. Listed as Standard by
Underwriter's Laboratories. Delivers 100 per cent output
for electric energy input.

A SERVICE

The Standard Oil Company (Indiana) offers the services of its staff of trained lubrication engineers.

A member of this staff will be glad to visit your plant and after familiarizing himself with the particular conditions under which your machinery operates, he will recommend the grades of oils and greases and the correct methods of application which will keep your equipment running at peak efficiency.

The profits you make depend, to a large degree, upon the efficiency with which your machinery operates. Long periods of faultless operation increase your profits. But it is only through the use of proper lubricants that you can hope to receive this type of service.

The oils and greases made by this company are the highest quality and dependability that present day knowledge and skill can produce. Every grade of

Standard Oils and Greases

is made with scientific accuracy to insure the best possible lubrication when used according to the recommendations of our engineers. No matter how modern or how complicated your equipment may be, there is a lubricant in the line of Standard Oils and Greases that will exactly suit the lubrication needs of each unit.

To avail yourself of the services of our lubricating engineers does not obligate you, and you are free to follow their recommendations and suggestions as you see fit.

Write or phone our nearest branch office. We will send an engineer to consult with you regarding the proper lubrication of your equipment.



STANDARD OIL COMPANY

(Indiana)

910 South Michigan Avenue

Chicago, Illinois

VERSARE

*interprets the
Convention's
Message*

!

**Meeting
the requirements
of better transportation
in the great majority
of American cities**

Comfort—Capacity

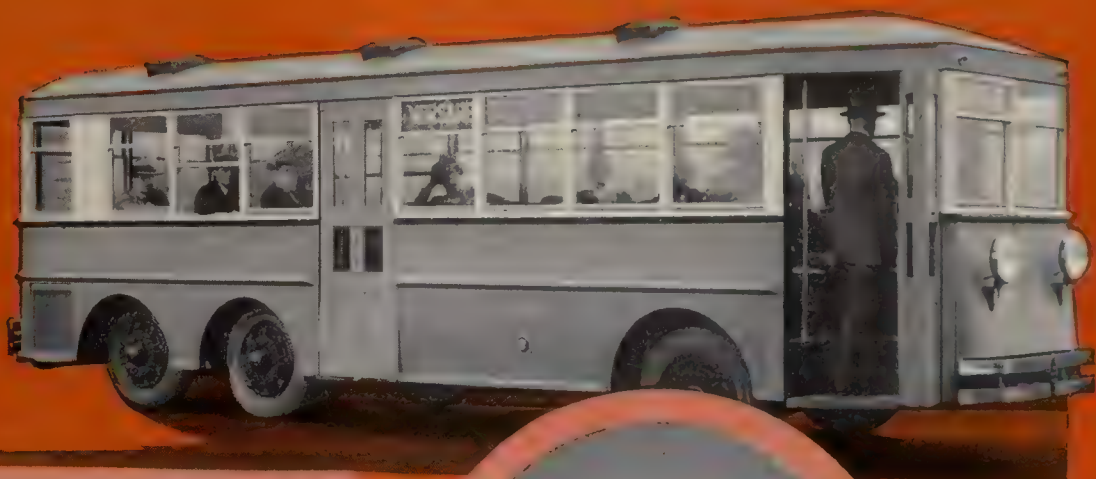
A “happy medium”
perfectly co-ordinated



The VERSARE Six-Wheel Rail Unit

1. *Weighs only 13,500 lbs.*
2. *Built entirely of Duralumin and light alloy steel.*
3. *Four wheel, single motor automotive type drive bogey in rear. Two wheel automotive type single motor drive axle in front.*
4. *Patented Versare Equalizer— floating ease in riding.*
5. *All body sections interchangeable with standard replacement units.*
6. *Drive truck and motors removable complete in half an hour.*
7. *High speed with safety.*
8. *Maximum passenger capacity with exceptional comfort. 32 seated, 32 standing.*
9. *Silent operation.*
10. *Westinghouse Standard Motors, control and safety air brake equipment. Internal band brakes.*
11. *Highest quality standard equipment throughout.*

—Speed and Safety *combination in two transportation units*



The VERSARE Six-Wheel Highway Unit

1. *No chassis.*
2. Duralumin rigid truss construction in accordance with railroad practice.
3. *Body maintenance practically eliminated.*
4. *Unit Power Plant mounted at rear. Quickly removable without crane.*
5. *Radiator and fan units separate from power plant. Easily removed from side of body.*
6. *No engine heat, oil or gas fumes can enter body.*
7. Body built of interchangeable units identical with those of the eight-wheel vehicle.
8. Versare Hercules-Westinghouse gas electric drive. Two 33-hp. vehicle traction type motors.
9. *Turning circle of 56 feet.*
10. *Electric brake. Westinghouse air service brakes and mechanical emergency brake.*
11. *Versare Patented Equalizer at rear drive axles— floating ease in riding.*



Details of VERSARE design that form the basis of a NEW standard in operating economy - - -



How Versare engineers have practically eliminated body maintenance - - - - -

At least one installation of Versare transportation units has completed between 125 and 150 thousand miles of service with absolutely no body maintenance of any kind.

Transportation men will agree that this is a record. How has it been accomplished?

Briefly, Versare engineers have developed and perfected an entirely new method of body building based on the girder-like truss construction well-known to railway designers. Both the rail and highway units are built of standard interchangeable sections under this plan, and by making use of the

most recent developments in lightweight Duralumin alloys it has been possible to use sections of generous proportions while drastically reducing the total weight of the structure.

Versare Units in service immediately strike the observer as being perfectly rigid. The usual rattles and squeaks do not develop. Windows and doors operate smoothly and quietly after years of running. There is, indeed, practically no depreciation as at present understood, and even after the vehicle is finally written off the books, the Duralumin commands an excellent scrap price.

VERSARE CORPORATION
Albany, N. Y.

VERSARE

The Economical Quick and Improved DeVilbiss Way of Refinishing

Cuts Maintenance Costs



to lowest
possible
point

Completeness and dependability of DeVilbiss Spray-finishing Equipment for every street railway car and bus painting requirement—advantages and economies derived from its use—vast experience and resources of DeVilbiss organization, ALL were demonstrated and explained at the great A.E.R.A. meeting just held in Cleveland.

It has been definitely proved that every operator of passenger carrying equipment can make highly profitable use of this quick and improved finishing or painting method.

Now let DeVilbiss engineering and service forces go further (1) in studying your individual finishing problems and (2) in outlining the unit of spray-finishing

equipment that will adequately and economically meet your individual needs.

Winter is at hand. It takes great toll of paint. Now is the time to prepare and protect. Consider the full value of speed of operation—of improvement in quality of work—of elimination of shop congestion—of better working conditions—of greatly cut maintenance costs, when your refinishing is done the DeVilbiss way. Let us work with you. Address—

THE DEVILBISS COMPANY
272 Phillips Ave. TOLEDO, OHIO

New York
Indianapolis
Cincinnati

Philadelphia
San Francisco
Milwaukee

Chicago
Pittsburgh
Minneapolis
Windsor, Ontario

Detroit
Cleveland
St. Louis

DeVilbiss ***Spray-finishing System***

For more than 35 years the name DEVILBISS has stood for practical, honest and dependable products



S P E C I F Y -

For
Assured Safety
Lower Maintenance
and
Longer Service



STANDARD STEEL

Philadelphia, Pa.

CHICAGO

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NEW YORK

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CH
POR



STANDARD"

WHEELS
ARMATURE SHAFTS
AXLES
and
SPRINGS

WORKS COMPANY

Work: Burnham, Pa.

ES:
MON

SAN FRANCISCO

ST. PAUL



PITTSBURGH

MEXICO CITY



A Remarkable Piece of Steel

THE Empire New Process Bolt is one of the most remarkable pieces of metal in the world. Manufactured in millions on wonderful automatic machines and shipped to all parts of the world, the marvel is that every one of these millions is just as accurate, held to just as close

limits as every other one and the tensile strength is unvaryingly in excess of 80,000 lbs.

Such uniformity of accuracy and strength is characteristic alone of Empire New Process Bolts owing to the special machinery and processes

invented, controlled or adapted by this company. The strength and lasting qualities of all manufactured products using Empire New Process Bolts are automatically increased over such products using ordinary bolts. Yet there is no difference in price.

Samples for testing will be furnished to responsible concerns.

RUSSELL, BURDSALL & WARD BOLT & NUT COMPANY PORT CHESTER, N.Y.

Branch Office: Straus Building CHICAGO	Branch Office: General Motors Bldg. DETROIT	Branch Factory: ROCK FALLS, ILL.	Strimple & Gillette 160 Jackson Street SEATTLE	Maydwell & Hartzell, Inc. 118-108 Eleventh Street SAN FRANCISCO
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Makers of Bolts, Nuts and Rivets Since 1845



This is the shadow of an Empire New Process Bolt Thread as shown on the chart of the Screw Thread Comparator.



This is the shadow of the thread of a hardened and ground gauge, as shown by the Screw Thread Comparator.

EMPIRE

Threads of Gauge-Like Accuracy



New
Process

BOLTS

Over 80,000 lbs. Tensile Strength



The DIFFERENTIAL CAR

is more than just a dump car

it is a

METHOD

Track built by the Differential
Method is economically built.

The Differential Method is the Approved
Method of More Than 66 Railways—

AT THE CONVENTION You Saw

THE DIFFERENTIAL CAR

THE DIFFERENTIAL LOCOMOTIVE CRANE CAR

THE CLARK CONCRETE BREAKER

THE DIFFERENTIAL BODY—3-WAY DUMP

You saw them work.

You could visualize them at work on your road.

Now: Let us give you figures showing actual savings
in time and labor by representative roads
using the differential method.

The
DIFFERENTIAL
STEEL CAR CO.

FINDLAY, OHIO



The Differential Body—3-Way Dump

VIZABLED G
PATENTED
SAFKAR
TRADE MARK REG
SAFSTEP

Get 'Em On and Off Safely

Whether they "step lively" or lag—whether they "watch their step" or not—whether they have "spike heels" or others—they'll get on and off safely if your cars have "**Safkar Safsteps.**"

Slip-proof, miss-proof, all-steel, non-slipping in all weathers, "**Safsteps**" will cut your car step accidents 90%—beside reducing your maintenance costs in substantial degree.

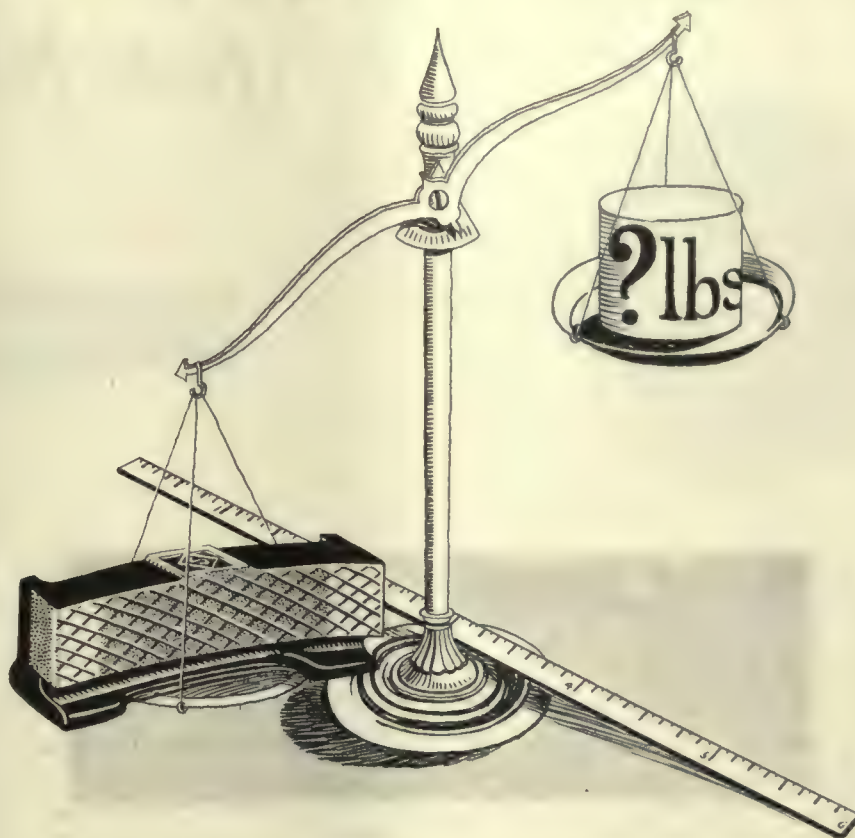
Ask us for Bulletin D-28



IRVING IRON WORKS CO.
LONG ISLAND CITY, N.Y. U.S.A.

Established in 1902

ATLANTA GA BALTIMORE MD BIRMINGHAM ALA BOSTON MASS BUFFALO N.Y. CHICAGO ILL CINCINNATI OHIO
CLEVELAND OHIO DALLAS TEXAS DENVER COLO DETROIT MICH EL PASO TEXAS HAVANA CUBA HOUSTON TEXAS
INDIANAPOLIS IND KANSAS CITY MO KNOXVILLE TENN MEXICO CITY MEX MILWAUKEE WIS MINNEAPOLIS MINN MONTREAL P.Q.
PHILADELPHIA PA PITTSBURGH PA ST. LOUIS MO SAN FRANCISCO CAL SALT LAKE CITY UTAH SEATTLE WASH SCRANTON PA UTAH



What Do Your Brake Shoes Weigh In Foot Pounds?

Were they measured by "dead weight," all brake shoes of an equal weight would be of equal value. But their worth depends upon foot pounds of work and American Brake Shoes *deliver* more work per pound of metal. Their value, therefore, rises to a point outdistancing all difference in price and returning lower brake shoe costs in electric railway service.

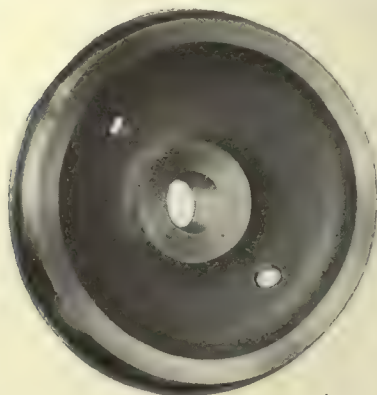
"Best by Test"

THE AMERICAN BRAKE SHOE AND FOUNDRY COMPANY

**30 CHURCH ST., NEW YORK
332 S. MICH. AVE., CHICAGO**

BETHLEHEM RAIL

for Electric



Ore to Finished Trackwork

All materials, rails, plates, bars, forgings, castings, bolts, etc., are made in Bethlehem Plants—from ore to finished product under Bethlehem constant supervision.

Great care and attention is given to special layouts. Before shipment layouts are assembled to make sure that they will correctly meet conditions in the field.

The fitting up work is done under roof where workmen are shielded from inclement weather, thus enabling them to do accurate work.

Bethlehem manufactures all types of frogs, switches, crossings and special layouts for Electric and Steam Railways; also mine track.



*Parallel Throw Switch Stand
Model 1222—4¾-in. high*



Center Rib Base Plate

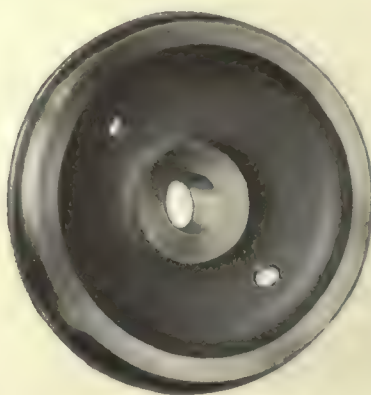


Abbot Base Plate

BETHLEHEM

RAILWAY PRODUCTS

for electric railways



Bethlehem Track Specialties include:

Special Trackwork; Tee and Girder Rails; Special Splice Bars for Welding; Machine Fitted Joints; Abbott and Center Rib Base Plates; Tie Rods; Bolts; Pole Line Material; Rolled Steel Wheels and Forged Axles.

Special Trackwork and Layouts

Catalog Sent on Request.



Solid Manganese Tongue Switch, Design 905



*New Century Switch Stand
Model 51-B*

BETHLEHEM STEEL COMPANY *General Offices: BETHLEHEM, PA.*

District Offices: New York Boston Philadelphia Baltimore Washington Atlanta Pittsburgh Buffalo
Cleveland Cincinnati Detroit Chicago St. Louis San Francisco Los Angeles Seattle Portland

Bethlehem Steel Export Corporation, 25 Broadway, New York City, *Sole Exporter of our Commercial Products*

BETHLEHEM

—and the reports all read
“Fort Pitt Springs O.K.”

For more than 20 years on leading railway properties, reports have read “Fort Pitt Springs O.K.” Thus they have reduced maintenance costs and have cut down idle car time in the repair shop—which means more hours of actual service out on the road.

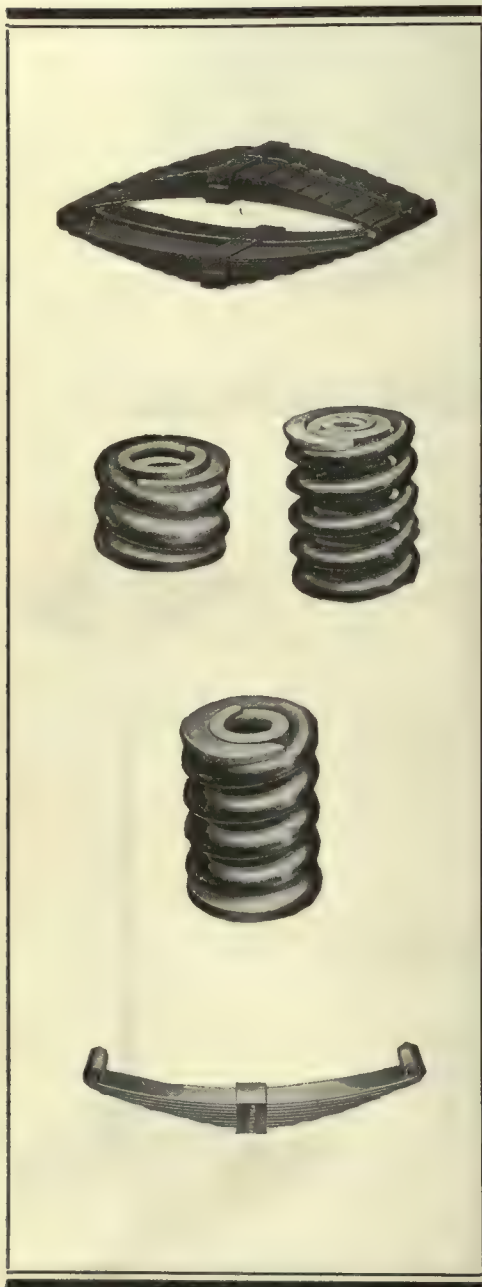
And Fort Pitt Springs will increase your revenue by increasing your patronage because of their quiet, comfortable-riding qualities.

Among our many items are—

Full Elliptics for Car Trucks; Half Elliptics for Locomotive and Cars; Special Types of Quarter, Half and Three Quarter Elliptics for Electric Railway Service. Drawbar Springs, Equalizer Springs, Extension Springs.

*Quotations on request. Prompt shipments guaranteed.
Ask for our Catalog and Specification Book.*

Fort Pitt Spring & Manufacturing Co.
Pittsburgh, Pa.



FORT PITT

More Miles of Service per dollar invested

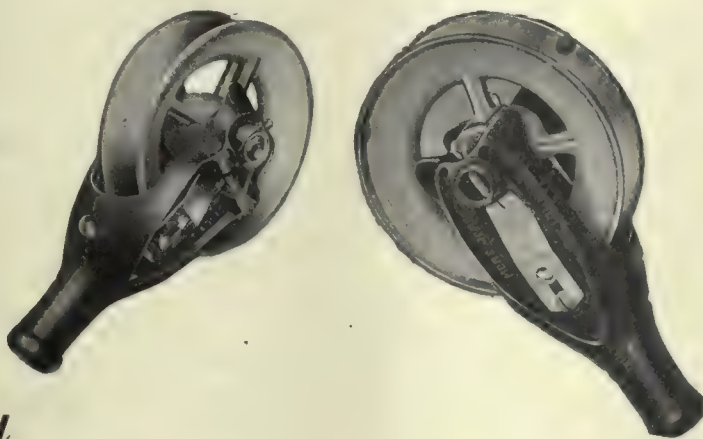
More-Jones Quality Products cut down maintenance requirements and make better service possible. Both large and small traction systems can profitably standardize on these products. In figuring operating costs it is easy to see that More-Jones Quality Products are

"lowest in ultimate cost and highest in net efficiency."

The uniformity of More-Jones Quality Products is known wherever used and can be depended upon.

Why not have the benefit of More-Jones experience in making quality electric railway equipment.

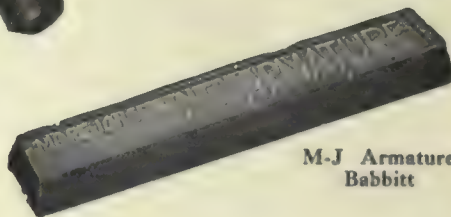
Trolley Wheels
and Harps



"Tiger" Bronze Axle
and Armature
Bearings



*Let us
give you
complete details
and prices*



M-J Armature
Babbitt

More Than 50 Years of Service

MORE-JONES QUALITY PRODUCTS

NATIONAL BEARING METALS CORPORATION

St. Louis, Mo.

RAILS

NEW AND RELAYING



Sooner or later you will need rails and accessories for new sidings, extensions or track repairs. When you do, you will want them in a hurry! Order from FOSTER—the only Warehouse in the U. S. where you can get complete track equipment, rails and accessories, 1 ton or 1000 tons, shipped within 1 to 24 hours after receipt of order. Quality always guaranteed—prices that do make a difference.

L.B.FOSTER COMPANY
PITTSBURGH ~ CHICAGO ~ NEW-YORK

If you have ever run a real gear test, and
You have followed it through until you
Know how long the different grades last, then
Relative Gear Quality

Will cause you to specify

“Tool Steel” Quality

We have available figures and data
compiled from comparative tests
which prove this statement.

The Tool Steel Gear & Pinion Co.

CINCINNATI, OHIO



The Standard of Quality

TOOL-STEEL QUALITY
GEARS AND PINIONS

The steadily growing



TROLLEY WIRE

Hitenso C
(High Strength Bronze)

Hitenso A
(Medium Strength Bronze)

Anaconda Tin Bronze
(High and Medium Strength)

Anaconda Hard Drawn Copper

COPPER WIRE AND CABLE

Bare and Weatherproof

Messenger and Guy Wire

Lead Sheathed Cable

Paper Insulated

Varnished Cambric Cable

Lead Sheathed or Braid Covered

ANACONDA

Responsibility of WIRE

AMONG those electric railway companies which have blazed the trail in modernization, there is hardly one whose lines do not show progressive improvement in overhead construction and maintenance.

Wire has shouldered a steadily growing responsibility. Not only has traffic become heavier, but operating speeds and public standards of safety have been raised with the growth of transportation needs. Wire must be more dependable, longer-wearing, and more accurately fitted to its applications, than ever before.

Anaconda Wire Products come to you backed by the experience and resources of the largest and most complete copper-producing organization in the world. Six wire mills offer a coast-to-coast service unequalled for promptness and dependability. Responsibility for the efficiency and economy of your modernized overhead distribution system could not be placed in more capable hands.

ANACONDA COPPER MINING COMPANY

THE AMERICAN BRASS COMPANY

Rod, Wire and Cable Products

General Offices: 25 Broadway, New York

Chicago Office: 111 West Washington St.



ROLLEY WIRE

What's Become of All the Wires?



*"Elreco" Combination Railway and Lighting Poles, St. Petersburg, Florida.
Note contrast between new "Elreco" poles and old wooden poles about to be removed.*

Gone, Never to Return!

Progressive companies realize that a confusion of poles and wires at the curb line are unnecessary and unsightly.

Replace them with Elreco Tubular Steel Poles, mounting modern lighting units. Elreco poles provide lightest weight, greatest adaptability, finest appearance, least maintenance, lowest cost.

Elreco combination railway and lighting poles permit inconspicuous stringing of wires at the top of poles. Underground conduits are eliminated, a tremendous saving in cost.

Consult us. Our entire facilities backed by twenty years' experience are at your disposal. Address—

The Electric Railway Equipment Co.

2900 Cormany Avenue

30 Church St., New York

Cincinnati, Oh

*"After all—
it's the Setting
that counts!"*

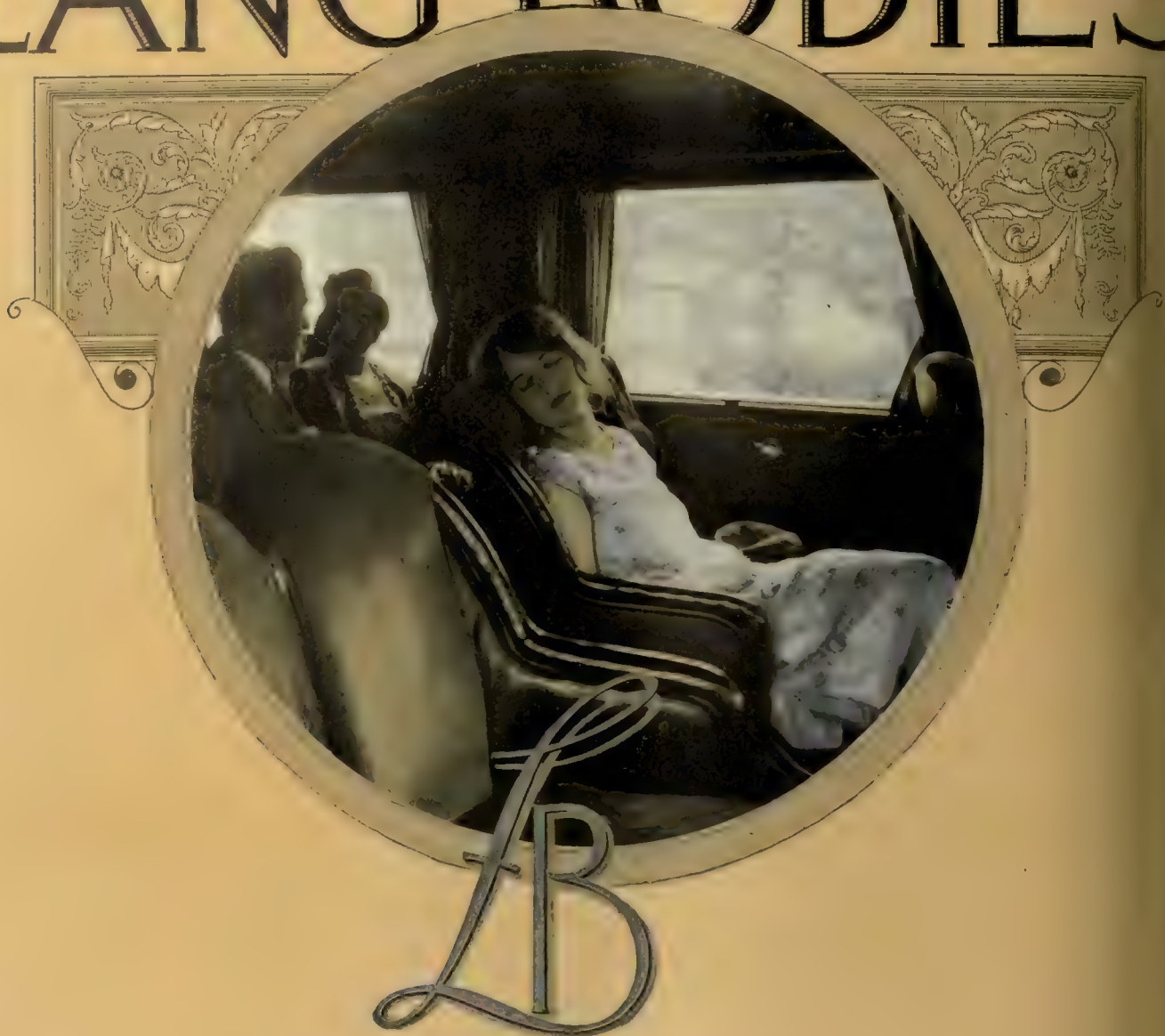


Only by the magic of complete relaxation may the golfer realize a perfect drive. Lang craftsmanship has built into a bus body the happy faculty for delivering its passengers soothed and rested — there's good will!



The Sterling Mark on Bus Bodies

LANG BODIES



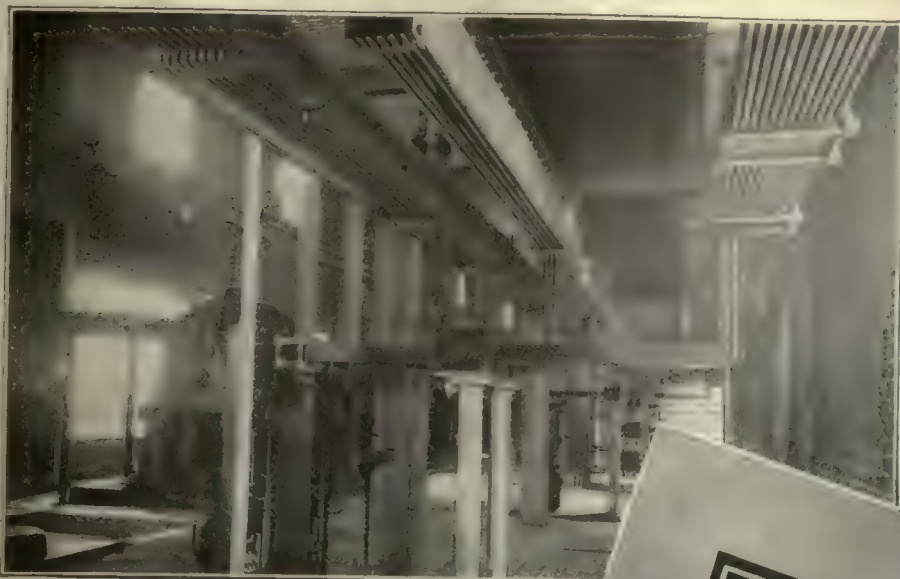
The Sterling Mark on Bus Bodies

LANG BODIES invite complete relaxation. Passengers yield instinctively to the soothing influence of the deeply upholstered seats and the many other refined appointments. Miles slip away with velvet smoothness. Long journeys

are made in comfort and safety. By surrounding passengers with every comfort and luxury, Lang Bodies help build revenue. By building strength into every detail of mechanical construction, years are added to body life.

THE LANG BODY COMPANY, CLEVELAND, OHIO





24,000 Ampere Aluminum Bus Line showing connections to circuit breakers.

*An interesting subject
for Electric Railways
and Industrial Stations
using large blocks
of power.*

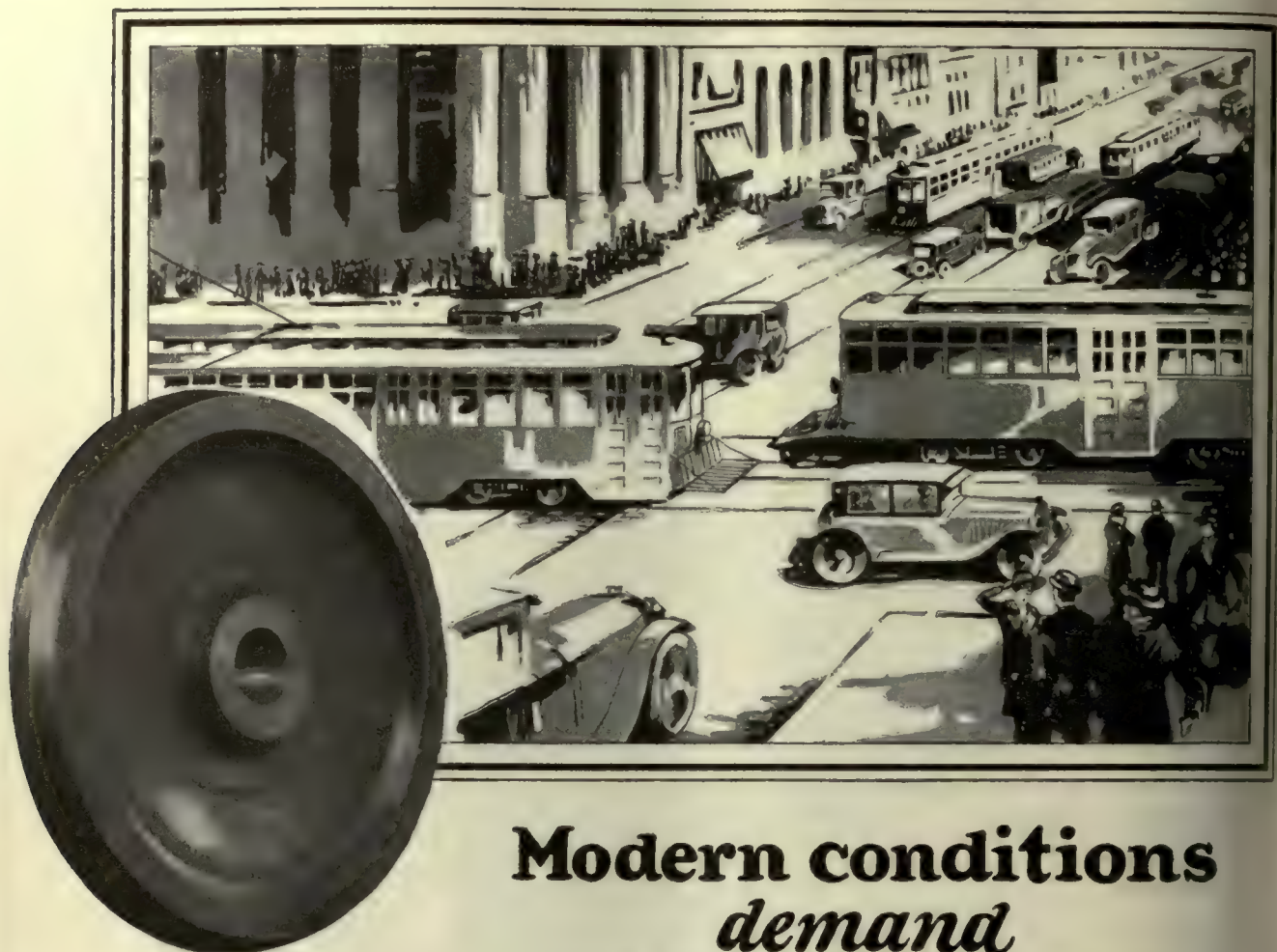


A new booklet &

ALUMINUM BUSBAR

Send for your copy of this booklet which is just off the press. It is a brief text book containing the information required by designing engineers, including: Carrying Capacity, Joints, Deflections and Stresses, Specifications and Tables. Sent post-paid on request, no charge.

ALUMINUM COMPANY of AMERICA
2303 OLIVER BUILDING - - - PITTSBURGH, PA.



Modern conditions *demand* modern equipment

Traffic conditions today are not what they were fifteen or twenty years ago. Equipment suitable then is now inadequate. Bigger cars, heavier loads, constant stopping and starting throw an ever increasing burden on equipment. Wheels bear the brunt of this burden.

Carnegie Wrought Steel Wheels assure high resistance to the wear and tear of modern traffic conditions. Wrought Steel is obtained through rolling and forging. A 10,000-ton hydraulic press (twenty million pounds!) forces the defects out of the steel—

insures a homogeneous structure, free from sand spots, blow holes, or other irregularities that might cause trouble. The rolling process rolls the mileage into the steel—mileage to spare. It is this extra mileage that makes Carnegie Wheels such an economical investment.

Before you invest in new wheels, investigate Wrought Steel. A catalogue will be sent at your request. Or one of our engineers will call, if you wish.

CARNEGIE STEEL COMPANY

General Offices • Carnegie Building • 434 Fifth Avenue

PITTSBURGH



PENNSYLVANIA

\$2.67 per year per pole!



Amcreco creosoted southern yellow pine poles on a Georgia Power Company line.

ONE large utility operator with many miles of creosoted southern yellow pine pole lines, most of them Amcreco, reports an average annual saving of \$281.98 per mile of pole line.

The average span of this company's lines was 105.6 poles per mile, and the average saving per pole was \$2.67!

Figure what such savings would mean on your lines. Your spans and conditions are no doubt different, and the savings might be less, but—they *might be more*.

A utility engineer with extensive pole line experience has figured the first cost and annual charges per mile on several types of wood poles for various spans. On a 200-ft. span, for example, he finds the annual charge for creosoted yellow pine to be 13% less than for the next lowest-priced competitive pole.

Careful engineering study before building your pole lines will save you money. Our nearest office will assist with information and quotations without obligating you.

SALES OFFICES

332 So. Michigan Ave.
Chicago

350 Madison Ave.
New York City

401 W. Main St.
Louisville, Ky.

Brunswick, Ga.
Bogalusa, La.

AMERICAN CREOSOTING COMPANY

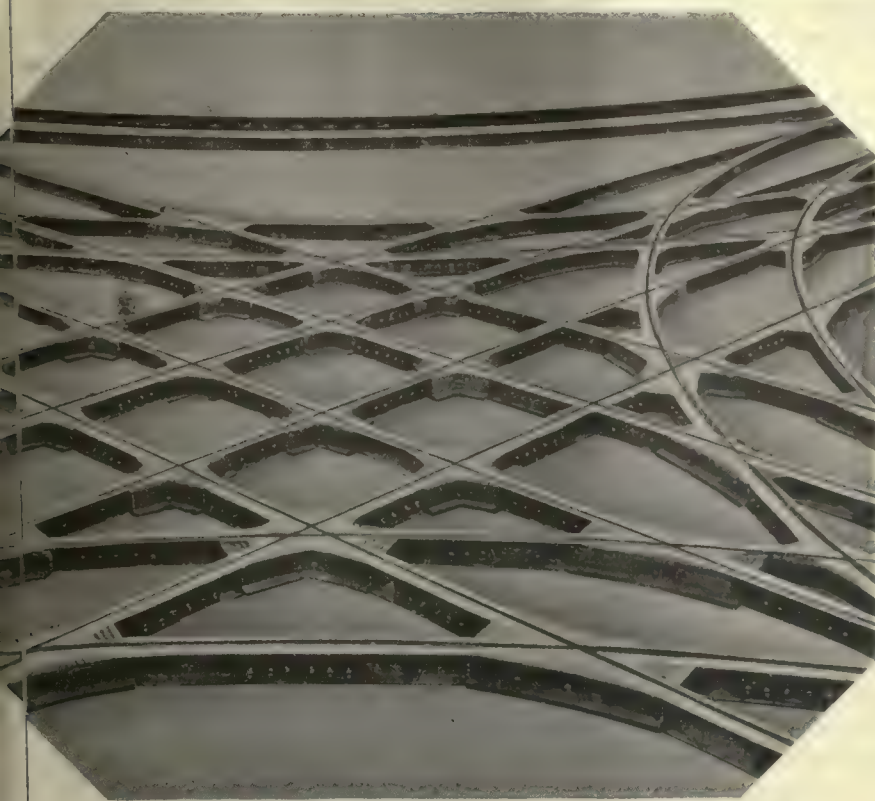
COLONIAL
CREOSOTING
COMPANY
INCORPORATED



GEORGIA
CREOSOTING
COMPANY
INCORPORATED

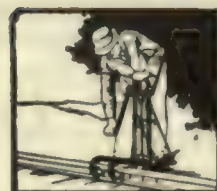
LOUISVILLE ~ KENTUCKY

ERJ 10-8-Gray



THOUSANDS of cars rumbling over Buda trackwork have testified to the quality of this equipment. Buda trackwork and equipment has been meeting the test of service for forty-seven years—is meeting it today. Buda is always an assurance of quality and service.

THE BUDA COMPANY
HARVEY (Chicago Suburb), ILL.



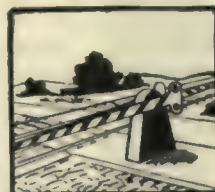
Track and Bonding Drill



Track Jack



Bus Engines



Crossing Gates



Electric Trucks



BUDA-HEBRON POST HOLE DIGGER

The Buda - Hebron Earth Drill, powered by the well-known Buda gasoline power plant, digs in clay, shale, hardpan, etc. as easily as in loam, and cuts the cost of erecting poles to a very appreciable extent.

Toncan Lasts Longer

Use It For Permanence

CORRUGATED iron culverts have the mechanical advantages of safe shipment; easy handling; low installation costs and strength to carry any reasonable load.

Added to these, culverts of Toncan Iron have the crowning quality of permanence.

Toncan Iron builds up its well-known resistance to corrosion and erosion by the inclusion of copper and molybdenum. These elements give the naturally resistant iron a still further protection against weathering and corrosion.

For permanence at reasonable cost, install Toncan Iron culverts.

CENTRAL ALLOY STEEL CORPORATION, Massillon, OHIO
World's Largest and Most Highly Specialized Alloy Steel Producers
Makers of Agathon Alloy Steels

Cleveland	Detroit	Chicago	New York	St. Louis
Syracuse	Philadelphia	Los Angeles	Tulsa	
Cincinnati	San Francisco	Seattle		



Following are the makers of Toncan Culverts.

Write the nearest one:

The Berger Mfg. Co., of Mass.
 Boston, Mass.
 The Berger Manufacturing Co.
 Dallas, Texas
 The Berger Manufacturing Co.
 Jacksonville, Florida
 The Berger Manufacturing Co.
 Minneapolis, Minn.
 The Berger Manufacturing Co.
 Philadelphia, Pa.
 The Berger Manufacturing Co.
 Roanoke, Virginia
 The Canton Culvert & Silo Co.
 Canton, Ohio
 The Firman L. Carswell Mfg. Co.
 Kansas City, Kan.
 The Pedlar People Limited,
 Oshawa, Ontario, Canada
 Tri-State Culvert Mfg. Co.
 Memphis, Tenn.
 The Wheat Culvert Co., Inc.
 Newport, Ky.

TONCAN

**COPPER
 MO-LYB-DEN-UM**

IRON

American Steel and Wire Company

A Bond of the Past

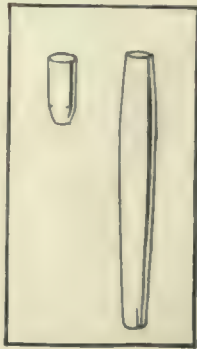


- of the Present - and of the Future

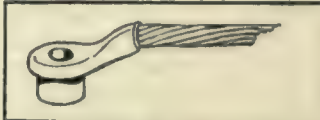
Various types of bonds have been developed to simplify installation without sacrificing performance, but none have met with greater favor than the Pin Terminal Rail Bond.

No cumbersome machinery or special tools are required to install this type of bond. A few blows from a hammer and the rail is efficiently bonded:—as simple as driving a nail. The only requisite for a lasting contact is a clean hole of proper size.

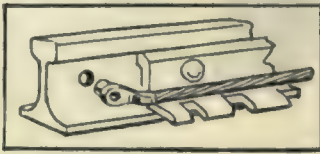
For the future:—high electrical conductivity and simplicity of application, assure extension of the use of Pin Terminal Rail Bonds.



The pin and taper punch



The bond



The bond in position for application. Drive the taper punch through, then the permanent pin.



The bond installed.
What can be easier?

SALES OFFICES

CHICAGO . . . 208 So. La Salle Street	ST. LOUIS . . . 506 Olive Street	NEW YORK . . . 30 Church Street	ATLANTA . . . 101 Marietta Street	WILKESBARRE . . . Miners Bldg.
CLEVELAND . . . Rockefeller Bldg.	KANSAS CITY . . 417 Grand Avenue	BOSTON . . . 185 Franklin Street	WORCESTER . . . 94 Grove Street	DALLAS Praterian Bldg.
DETROIT . . . Foot of First Street	OKLAHOMA CITY . . First National Bank Bldg.	PITTSBURGH . . . Frick Bldg.	BALTIMORE . . 32 So. Charles Street	DENVER . First National Bank Bldg.
INDIANAPOLIS . . Union Trust Bldg.	BIRMINGHAM . . Brown-Marx Bldg.	PHILADELPHIA . . Widener Bldg.	BUFFALO . . . 670 Ellicott Street	SALT LAKE CITY . Walker Bk. Bldg.
MINNEAPOLIS—ST. PAUL . . . Merchants Nat'l Bk. Bldg., St. Paul	MEMPHIS . . . Union and Planters Bank Bldg.			



ROL-MAN

Truck and Car Parts

for Brooklyn and Manhattan Transit and
Philadelphia Broad Street Subway Cars

Repeated shocks under heavy loads. Continuous grinding wear under heavy pressure. Little or no lubrication. These are the causes of rapid depreciation of truck and car parts, with a consequent loss of service, labor and revenue due to repeated pull-ins for repairs and renewals.

This is an efficiency age and efficiency means economy. It is not difficult to figure savings in dollars by the use of ROL-MAN parts to avoid the above losses.

For several years past, the Brooklyn-Manhattan Transit Corporation has used ROL-MAN Manganese Steel truck and car parts for replacement of carbon-steel in existing equipment, such as pedestal and journal box liners, bolster and transom chafing plates, and similar parts where excessive wear had occurred.

The sixty-seven three-car articulated units recently built for the B.-M. T. represent a great forward step in development of transportation. As a result of their past experience with ROL-MAN every point of abrasive or frictional contact on these cars is protected with ROL-MAN Manganese Steel Wear Plates. The total movement between journal boxes and pedestals is limited to 1/16 in. in either direction and it is a significant fact that the liners on these parts and nearly all others are face riveted in place. This, in the light of their past experience, as this road has never removed a manganese steel plate when once applied.

The Philadelphia Rapid Transit Co. has also made test installations of ROL-MAN and as a result the 150 cars now being built for the new Broad Street Subway are fully protected against wear by the most extensive use of ROL-MAN parts made to date.

ROL-MAN parts are long-lived because they resist wear. In fact, their resistance to abrasion actually increases as they become toughened and hardened under repeated impact and friction. Consequently, they last for years and require a minimum of attention. Think what that means to you in keeping your cars out on the lines earning dividends rather than in the shops eating up profits.

You will notice, too, since the wear on ROL-MAN Parts even over a period of years is almost imperceptible, that cars equipped with them have less vibration and consequently operate with much less noise.

ROL-MAN PARTS

Journal Box and Pedestal
Gibs or Liners
Bolster and Transom
Chafing Plates
Bolster Hanger Wear Plates,
Axles and Supports
Bolster End Wear Plates
Side Bearing Wear Plates
Brake Rod Chafing Plates
Buffer Wearing Plates
Sector Bar Liners
Draw Bar parts for car
bodies
Motor Nose Bearing and
Wear Plates

A request from you
will bring our En-
gineer of Railway
Equipment to dis-
cuss the possibili-
ties with your Me-
chanical people.

USED BY

Brooklyn-Manhattan Tr. Corp.
Denver Tramway Corp.
Erie Railroad Co.
Hudson & Manhattan R. R. Co.
Indianapolis St. Railway Co.
Newport News & Hampton Rwy.,
Gas & Electric Co.
New York Rapid Transit Corp.
Phila. Rapid Transit Co.
Sacramento Northern Railway Co.
Stenberville, East Liverpool &
Beaver Valley Traction Co.
Pacific Electric Railway Co.
Houston Electric Company
Eastern Mass. Street Railway Co.
Washington, Baltimore &
Annapolis Electric R. R. Co.
Phila. Broad St. Subway
Illinois Power & Light Corp.
West Penn Railways

MANGANESE STEEL FORGE CO.

Richmond St. and Erie Ave.

Philadelphia, Pa.

MANUFACTURERS OF ROL-MAN ROLLED MANGANESE STEEL PRODUCTS

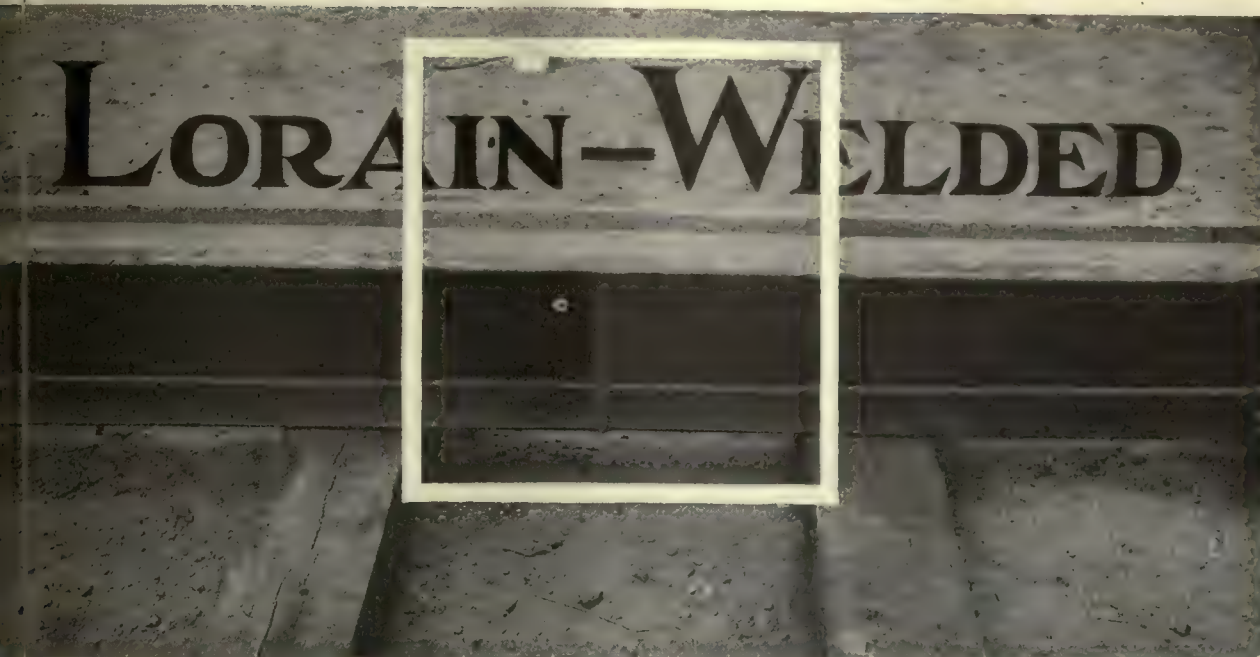
NEW YORK
30 Church St.

CHICAGO
Old Colony Bldg.

PITTSBURGH
Oliver Bldg.

LOS ANGELES
320 S. San Pedro St.

DETROIT
Lexington Bldg.



1,497,000 WHEEL PASSES!

(OFFICIAL BUREAU OF STANDARDS TEST)

This is a tremendously effective demonstration of the endurance and wearing qualities of The Lorain method of "Weld-Forging." Each blow of the test represents the shock of a car wheel at a bad joint. If Lorain Joints were bad, they would still stand many times the traffic abuse of other joints.

But—The Lorain Method, employing the "Forge-while-hot" system, finishes off joints which to all appearances and effects are but points in a perfectly smooth, one-piece rail.

Is it economical? Figure it out, with our help. The job is quickly done, and the joint is the strongest part of the rail!

The Lorain Steel Company

General Offices: Johnstown, Pennsylvania

Sales Offices:

Atlanta Chicago Cleveland Dallas New York Philadelphia Pittsburgh

Pacific Coast Representatives: U. S. Steel Products Co., San Francisco, Seattle, Portland, Los Angeles

Export Representatives: United States Steel Products Co., New York

LORAIN

SPECIAL TRACKWORK—GIRDER RAILS—SWITCHES, ETC.



*Above—Concrete Signal Tower,
Southern Pacific Railroad,
Oakland Pier, California.*

*At left—Interior view of Con-
crete Signal Tower, Oak-
land Pier, California.*

To Guard Life and Property

RAILROAD OFFICIALS realize the folly of gambling with the safety of life and property. They insist upon the most efficient traffic control systems that human ingenuity can devise.

Signal towers of *portland cement concrete*—durable, fire-safe and economical—offer the *utmost* protection to the control equipment upon which safety and continuous operation depend.

PORTLAND CEMENT Association
Concrete for Permanence CHICAGO



Bird's eye view of Plant and Storage yard.

Prettyman Preserved Forest Products now on the market

Our large modern Shipley designed pressure treating plant was completed and began operating September 8th. We carry large stock piles, poles, ties and timbers, operate our own mills enabling us to make prompt shipment.

CREOSOTED

Railroad Cross-ties, Switch Ties, Bridge Timbers, Construction Timbers, Mine Timbers, Lumber, Piling, Poles, Posts, and other Forest Products.

Also manufacturers of Southern Yellow Pine, Cypress and Hard Woods. Owning 60,000 acres of timber land, insuring our source of supply of raw material.

Excellent Rail and Water Shipping Facilities

Your inquiries solicited, cost estimates cheerfully furnished. A trial order will convince you that the quality of our product and our service is unequalled.

Eastern Sales Agents

NEW ENGLAND WOOD PRESERVING COMPANY, INC.

Chamber of Commerce Building, Boston, Mass.

350 Madison Avenue, New York, N. Y.

J.F. Prettyman & Sons
Wood Preserving Plant
Charleston, S. C.

Wm. Wharton Jr. & Co.

Incorporated

Announces

The New Wharton Solid Manganese Steel Crossing

(Patented)

Scientifically designed from data determined by Beggs' Deformeter Method. (Using elastic models to determine stresses)

Results checked according to Polarized Light Method by Prof. Sayre.

Designed to meet particular conditions of speed, curvature, angle and load.

Plant: Easton, Pa.

SALES OFFICES:

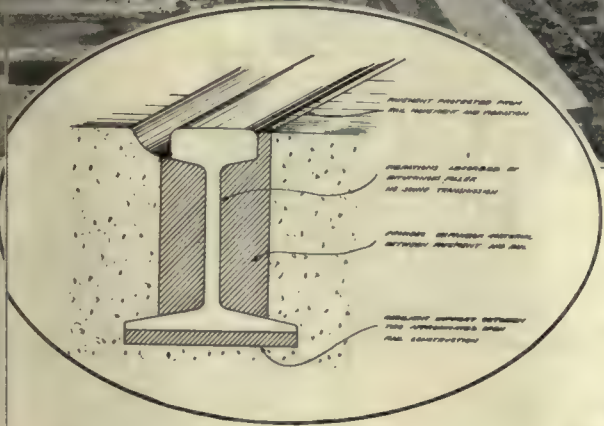
Boston
Philadelphia

Chicago
Pittsburgh

El Paso

Montreal
San Francisco

New York
Scranton



Installing Servicised Rail Filler, Sioux City, Iowa

Sound-Deadening the “Servicised Way” Means Real Pavement Protection—Longer Rail Life—and Economy in Installation and Maintenance

Servicised Advantages

Recent researches on the use of bituminous rail filler have definitely shown its advantage over the other types of filler and standard construction in numerous localities now include the installation of such a material.

Servicised Rail Filler is effective in the following ways:

- Sound deadener
- Waterproofing for rail
- Protection for pavement due to expansion and contraction
- Resists weather and traffic action
- Economical installation

The base is a high grade blown petroleum asphalt selected for its resiliency, weather-resistance, and low temperature susceptibility. The material is uniformly reinforced by low fibre saturated felt which adds to its strength and reduces brittleness. The mixture of asphalt and felt forms the waterproofing matrix for the partially saturated cellular filler which gives Servicised Rail Filler its remarkable sound-deadening qualities.

Correct proportioning and perfected processing of these carefully selected materials it has been possible to produce a superior type of track insulation.

Servicised Rail Filler meets the most rigid requirements for proper track insulation. Its unusual sound-deadening qualities are due to its carefully proportioned bituminous construction—a construction that also insures water-proofing for the rails, protection to the pavement due to expansion and contraction, resistance to weather and traffic action, and low installation and maintenance costs.

Write us today for detailed information on this superior type of track insulation.

SERVICISED PRODUCTS CORPORATION

Factory and General Offices

6051 W. 65th Street

Monadnock Bldg.,
Chicago, Ill.

SALES OFFICES

Dime Bank Bldg.,
Detroit, Mich.

Chicago, Illinois

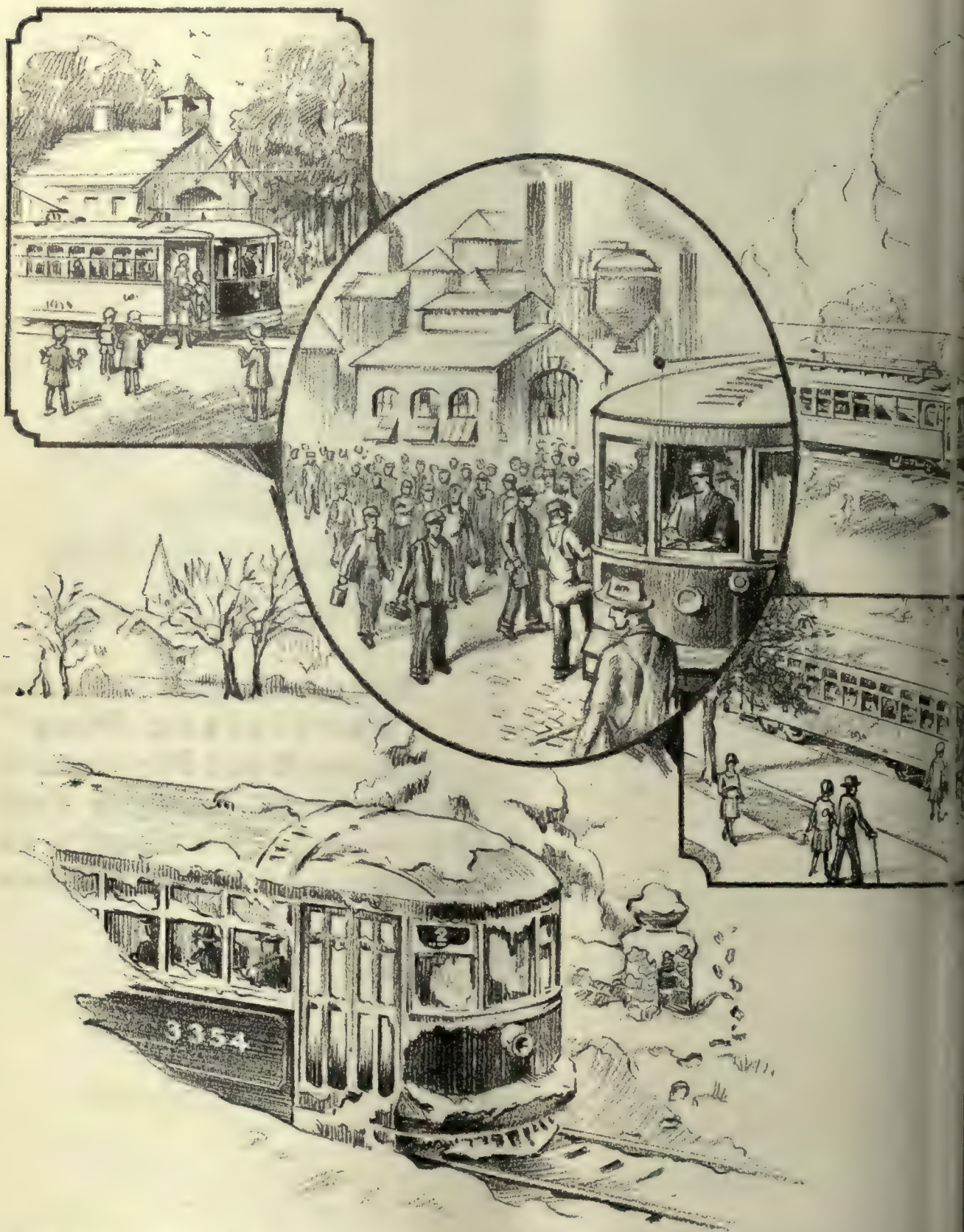
Bankers' Trust Bldg.,
Philadelphia, Pa.

DISTRIBUTORS AND DEALERS IN PRINCIPAL CITIES

Your inquiries addressed to any of these offices will be referred immediately to our representative in your district.

SERVICISED
PAT. OFF. © 1918
REG. U.S.

RAIL FILLER



Car Card Advertising



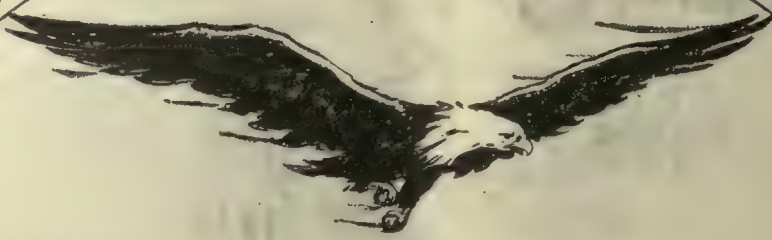
Electric Railway Service has established itself as an essential in American community life. Year by year the industry grows and justifies and confirms our original confidence in its stability. Our faith in the future of the Electric Railway has led us to build up and sustain an asset on which the operating companies can rely.

Barron G. Collier

INCORPORATED

CANDLER BUILDING - NEW YORK

almost everywhere !



Chilled Tread Wheels

*Cost less per ton mile and
carry a service guarantee*

Better Every Year

A slogan and a
fact based upon
definite labora-
tory and foundry
programs



A. R. A. Standards

650-lb. wheel for
30-ton cars

700-lb. wheel for
40-ton cars



58 Plants

Daily Capacities

20,000

Wheels

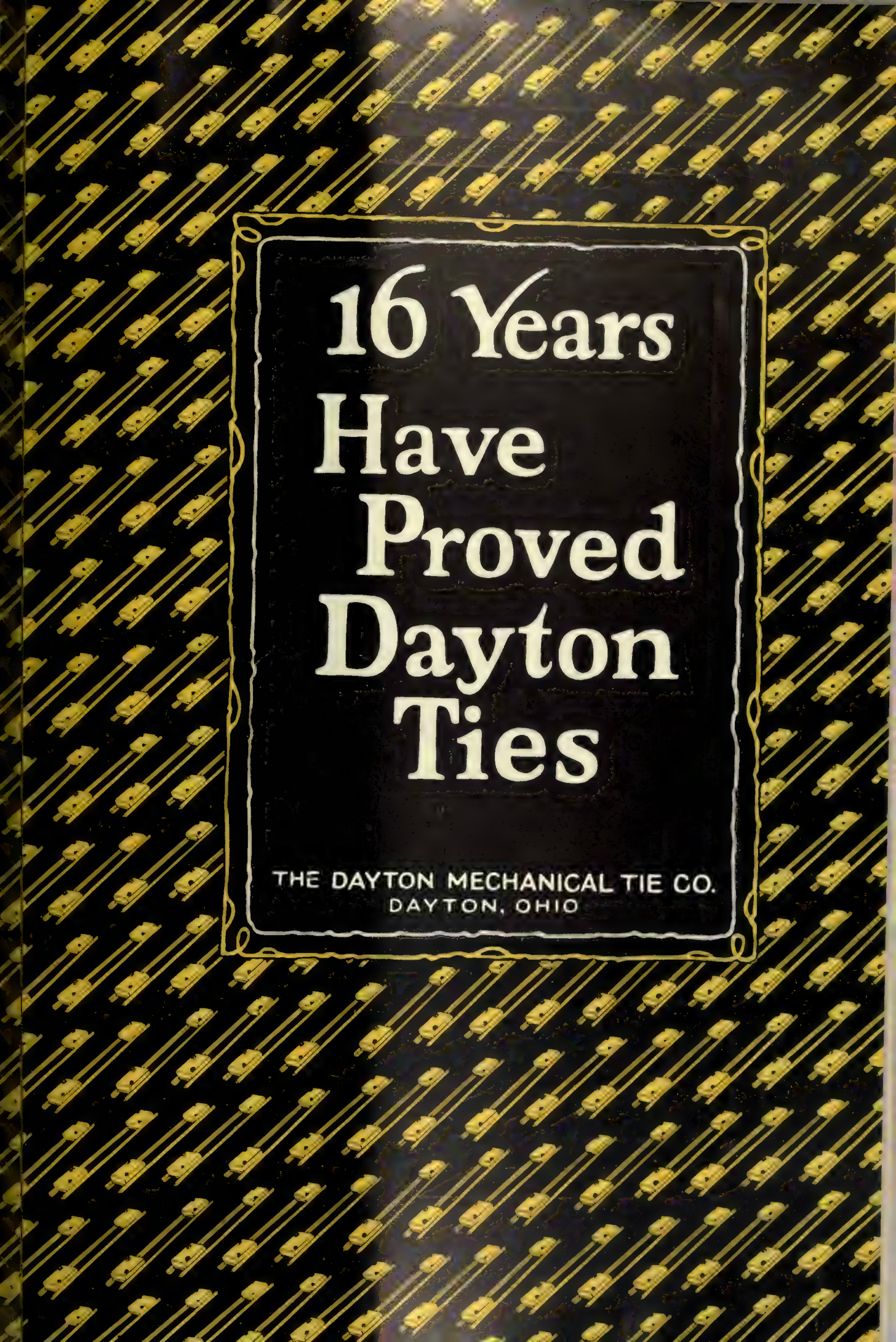


A. R. A. Standards

750-lb. wheel for
50-ton cars

850-lb. wheel for
70-ton cars

ASSOCIATION OF MANUFACTURERS OF CHILLED CAR WHEELS
1847 McCORMICK BUILDING • CHICAGO



16 Years Have Proved Dayton Ties

THE DAYTON MECHANICAL TIE CO.
DAYTON, OHIO

16 Years Have Proved Dayton Ties

In the 16 years we, and the electric railways, have been studying Dayton Ties, no need for change in the basic principles has become apparent. In the tie itself, not a single weakness has shown up. This, we believe, is almost unprecedented in the history of manufacturing.

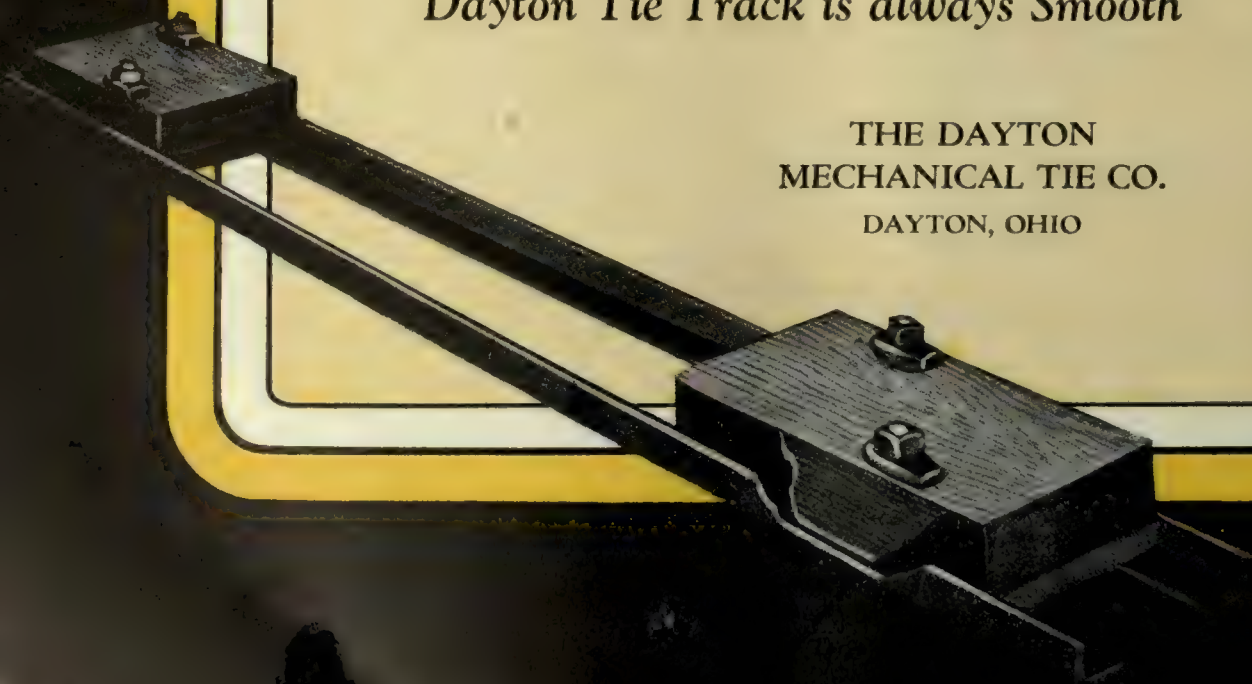
Track laid on Dayton Ties stays smooth—for years and years—we don't know how many—we haven't been in business that long.

We feel that this record demonstrates conclusively that we have *the* cure for track troubles.

The widespread use of Dayton Ties—now in nearly 150 cities throughout the United States—the way in which engineers keep on using them after they have once been tried, shows that the industry appreciates their excellence.

Dayton Tie Track is always Smooth

THE DAYTON
MECHANICAL TIE CO.
DAYTON, OHIO





One of the
Grand Rapids
cars utilizing
HASKELITE
roofs and inter-
ior linings and
PLYMETL side
panels.

The 1927 Coffin Award Winner pioneered with HASKELITE and PLYMETL

THE Grand Rapids Railway Company, announced last Tuesday as the winner of the 1927 Coffin Award, was one of the first Electric Railways to realize the magnitude of the economy possible through the use of HASKELITE and PLYMETL in light-weight cars.

The actual saving in weight by the adoption of these materials was 134 pounds for the HASKELITE roof and interior lining, and 435 pounds for the PLYMETL side panels, a total of 569 pounds per car.

In a recent letter from Mr. L. J. DeLamarter, Vice-President and General Manager, regarding these cars, he says they have been watching them very carefully and are well pleased with their service.

These plywood products are making savings for scores of other Electric Railways, including every one of the companies that has been given the Coffin Award since it was established in 1923.

Why not write today for the blue-print booklet showing applications in street car and bus construction?



HASKELITE MANUFACTURING CORPORATION

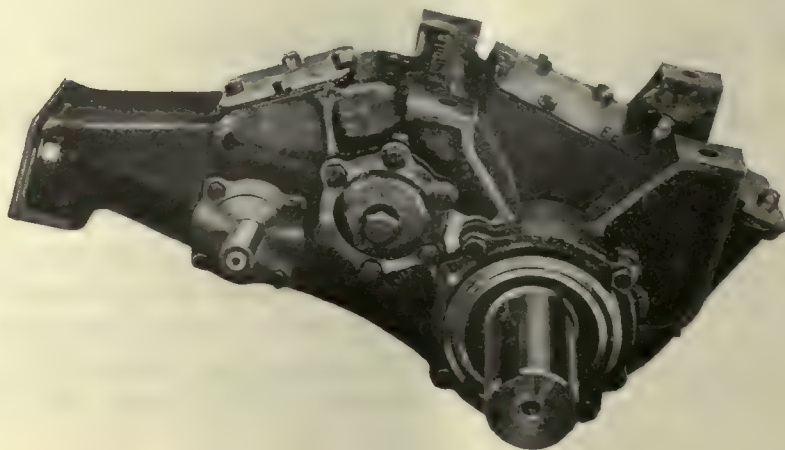
133 West Washington Street, Chicago

RAILWAY REPRESENTATIVES:

Economy Electric Devices Co., 37 W. Van Buren St., Chicago
Grayson Bros., 600 La Salle Bldg., St. Louis, Mo.

George E. Watts, 1523 Candler Bldg., Atlanta, Ga.
Railway & Power Engineering Corp., Toronto, Ont., Can. ERJ10-8Gr

Two Developments of To the Electric The WN Drive for Electric Cars



Light and compact the WN Drive with its high ratio of speed reduction allows the use of high speed motors in electric car service. The result is a smaller initial investment, greater efficiency, lowered maintenance costs, and smooth, quiet operation.

Heat treated and hardened helical gears mounted on Timken Roller Bearings enclosed in an oil-tight aluminum case makes the WN drive the most revolutionary development in the street railway industry in the past decade.



R. D. Nuttall Company

All Westinghouse Elec. & Mfg. Co. District Offices are Sales Representatives

Nuttall

Tremendous Importance Railway Industry

The Aluminum Trolley Base



This aluminum trolley base is the lightest base we have ever built. It weighs but 67 pounds. The base swivels on double race Timken Roller Bearings, it is provided with hardened steel wearing parts, and it requires lubrication but once in each six months.

This base is highly sensitive, it swivels freely, and it will follow the trolley wire unerringly. Dewirements will be reduced to a minimum, and the lighter, freer turning base will cause less wear on the trolley wire and other overhead.

Pittsburgh, Pennsylvania

Electric Railway Products. In Canada, The Lyman Tube & Supply Co., Montreal

Nuttall

Poor lubrication at 2 cents a mile —the best at $\frac{1}{4}$ to $\frac{1}{2}$ cent

Hundreds of operators of buses, trucks and taxicabs are paying four to eight times more for inefficient lubrication than they need pay for the very maximum of bearing protection.

Based on the generally accepted fact that poor lubrication is responsible for 75 to 80% of all automotive repairs, and for a great reduction in the useful life of the motor, it can be easily proved that the extra wear and tear resulting from the continued use of dirty, diluted oil costs 400 to 1000% more than the oil itself.

For example, if, because of inefficient lubrication, your \$6000 vehicle runs but 100,000 miles as against a possible 150,000 miles with good lubrication you

have lost one third of your investment or \$2000. In other words, poor lubrication has cost you \$20.00 per 1000 miles—2 cents a mile—plus actual oil costs.

Those who have thoroughly studied the subject will tell you a simple way to keep oil costs and repair cost low and at the same time get the greatest possible mileage out of a motor vehicle. It is just this: fill your crankcase with the best oil you can buy regardless of its cost—drain frequently—thoroughly purify the drainings and use again like new oil.

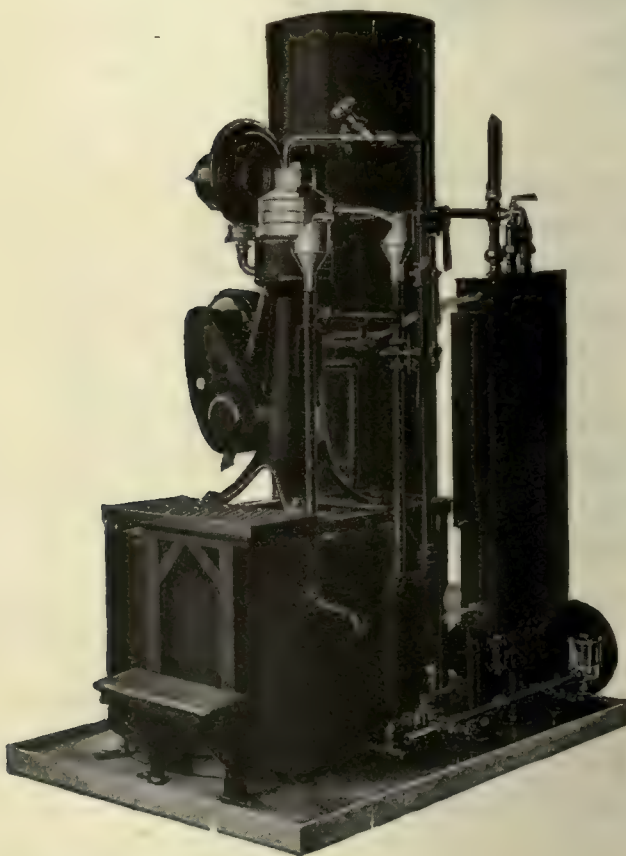
This brings lubricating costs back where they belong—at $\frac{1}{4}$ to $\frac{1}{2}$ cent a mile—probably where most operators *think* they now are.

The De Laval Crankcase Oil Reclaiming Outfit enables you to do this. It renews old oil at a fraction of its cost—removes carbon and other impurities—restores its viscosity—its ability to lubricate and resist heat—makes it still more economical to use the best oil and change every few hundred miles.

This Outfit has passed the rigorous tests devised by several of America's leading engineering organizations. Of still greater importance, it has passed the test of actual commercial operation in many garages. Lubrication engineers declare that the efficiency of De Laval reclaimed crankcase oil is fully equal to that of the original oil as it comes from the refinery and the experience of users bears this out.

If you operate 15 or more vehicles it will pay you to write for further information.

Ask for Bulletin 108-R.



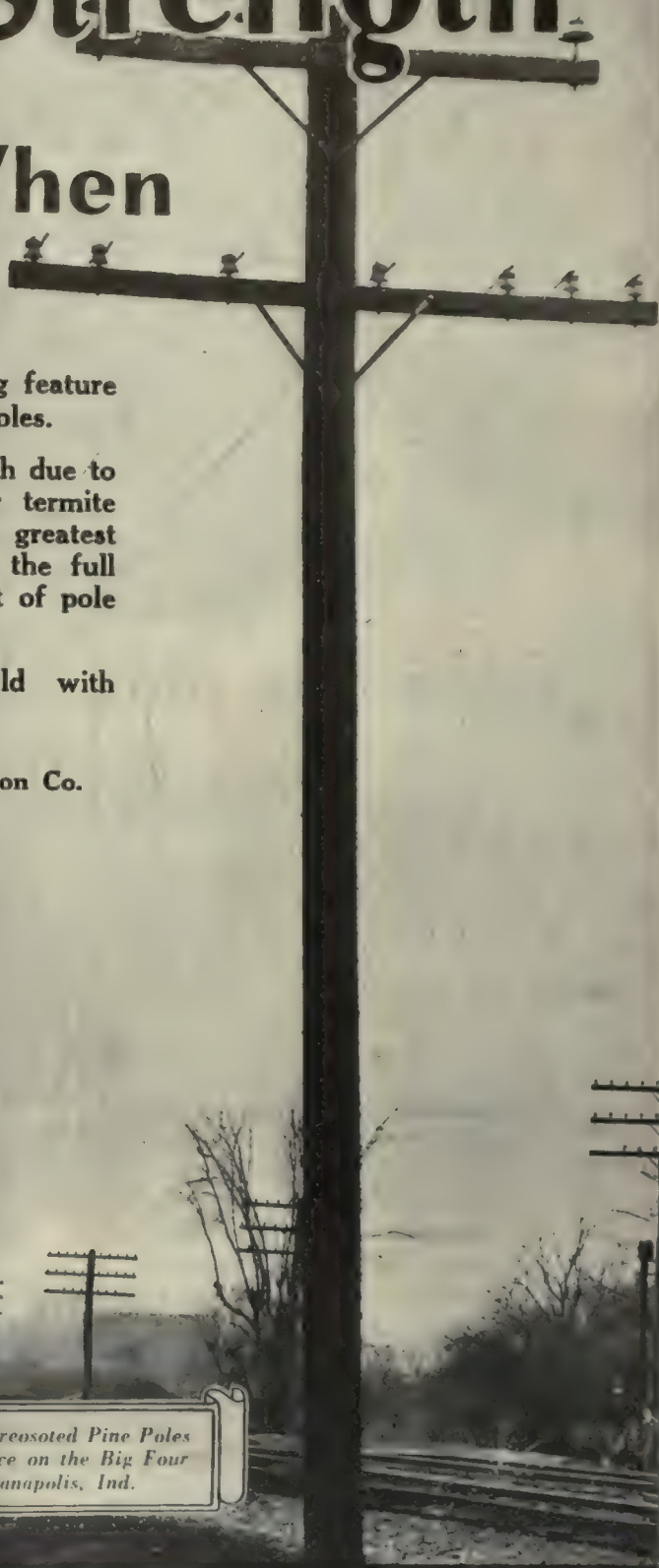
THE DE LAVAL SEPARATOR COMPANY
165 Broadway, New York 600 Jackson Blvd., Chicago
DE LAVAL PACIFIC COMPANY, San Francisco
ALFA-LAVAL CO. Ltd., 34 Grosvenor Road, London, S. W. 1.

DE LAVAL

Centrifugals

Lasting Strength

Counts Big When Storms Rage

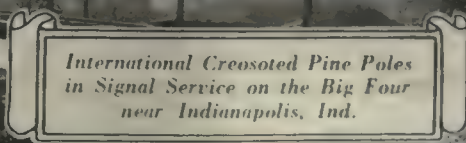


LASTING strength is the outstanding feature of *International Creosoted Pine Poles*.

There is no gradual decrease in strength due to decay or weakening due to birds or termite attacks. When storms rage and the greatest strains come, they are conquered by the full strength of Yellow Pine—the strongest of pole woods.

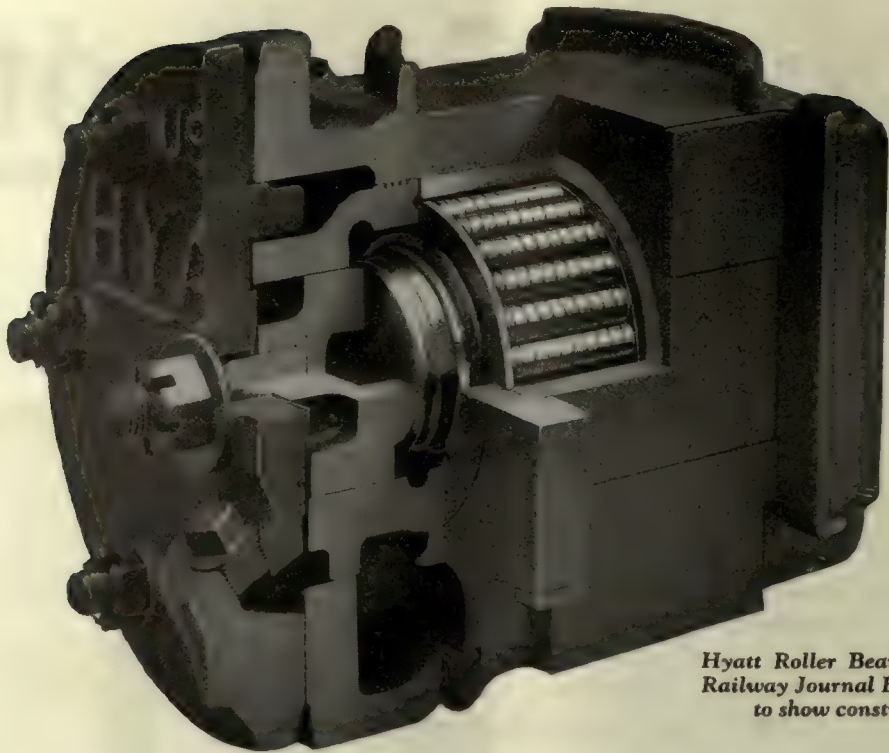
When you build your line — build with *International Creosoted Pine*.

International Creosoting & Construction Co.
General Offices—Galveston, Texas



*International Creosoted Pine Poles
in Signal Service on the Big Four
near Indianapolis, Ind.*

International Pressure Creosoted Yellow Pine Poles



*Hyatt Roller Bearing Electric
Railway Journal Box cut away
to show construction.*

Economy plus SAFETY with Hyatt Roller Bearings

THAT modern bearings are productive of increased saving has been established. Through fourteen years of service in the electric railway field Hyatt Roller Bearings have demonstrated that such bearings are reliable, safe and trouble-free also.

A Hyatt equipped car operating over a most exacting interurban route in the middle west has a record of well over 200,000 economical miles with minimum bearing attention.

Definite evidence such as this, accrued through actual performance, has led many traction companies to specify Hyatt Roller Bearings. Thus

it is that the largest single order for anti-friction equipped cars to date, placed by a Southern property, specified "Equipped with Hyatt Roller Bearing Journal Boxes."

Hyatt Roller Bearings reduce oiling and maintenance cost, and lower the peak load demand. Their operation adds to passenger comfort through quicker starts, easier acceleration, and smoother riding, all of which paves the way to increased patronage.

To realize the utmost in bearing performance, and to be sure that the performance will be consistently dependable, specify Hyatt Roller Bearings.

HYATT ROLLER BEARING COMPANY
Newark Detroit Pittsburgh Chicago Oakland

HYATT

ROLLER BEARINGS

PRODUCT OF GENERAL MOTORS

The Economy of Electric Fare Registration

"The cost of this electrical combination does not exceed that of manual installation of the same type of register."

The lost motion of hand registration by the operator is eliminated. Considerable economy in the speed and handling of fares and passengers is the result. The R-11 International Double Register has, for many years, been the accepted standard for mechanical operation. Our B-12 electric back has been developed to a point where a million fares have been registered with no noticeable wear on the working parts. These backs are operated by Solenoids operating on line current of 350-650 volts D.C. but this operating current is not broken in the register back. This circuit is completed by the F-14 foot switch, a fast switch combining small size, maximum insulation, and minimum arcing.

Single fare registers, backs, and switches may also be had in these same general types.

Full details furnished on request



R-11 Double Register



B-12 Electric Back



E-14 Electric Foot Switch

The International Register Company
15 South Throop St., Chicago

*Where Selection is
decided by
Performance*

"NATIONAL" TUBULAR STEEL POLES
Predominate

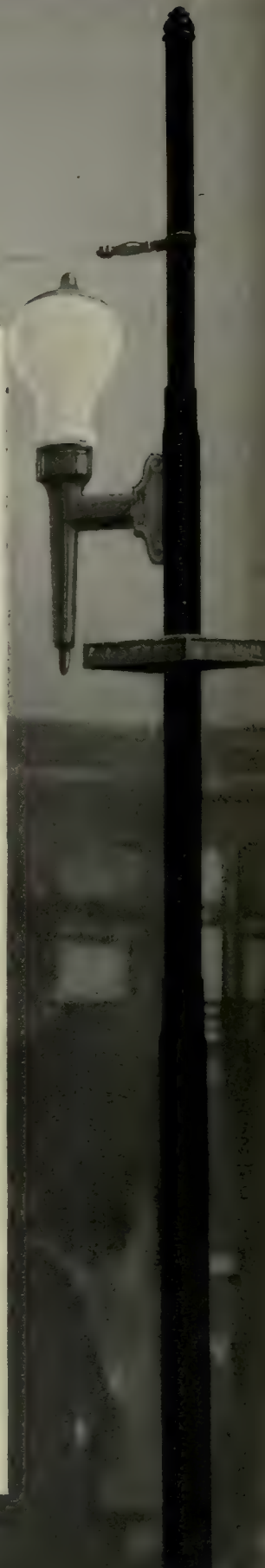
EXPERIENCE has taught many valuable lessons in the selection of poles for trolley lines, electric lighting, telephone, telegraph, and signal systems. Perhaps the lessons of greatest value are those which resulted in the policy of choosing poles for long life, reliability, and, especially, for safety. The recognized safety (dependability) of "NATIONAL" Tubular Steel Poles is a consideration of first and ultimate importance as evidenced by the extensive use of "NATIONAL" Poles throughout America.

Wherever the factors of safety, strength and appearance dominate, it will pay you to specify "NATIONAL" Poles. Made by the largest manufacturer of wrought tubular products in the world, with facilities for meeting a wide range of specifications in pole construction.

NATIONAL

NATIONAL TUBE COMPANY

Frick Building, Pittsburgh, Pa.



20th CENTURY METHODS

Applied to Woodworking and Metal Trim Problems

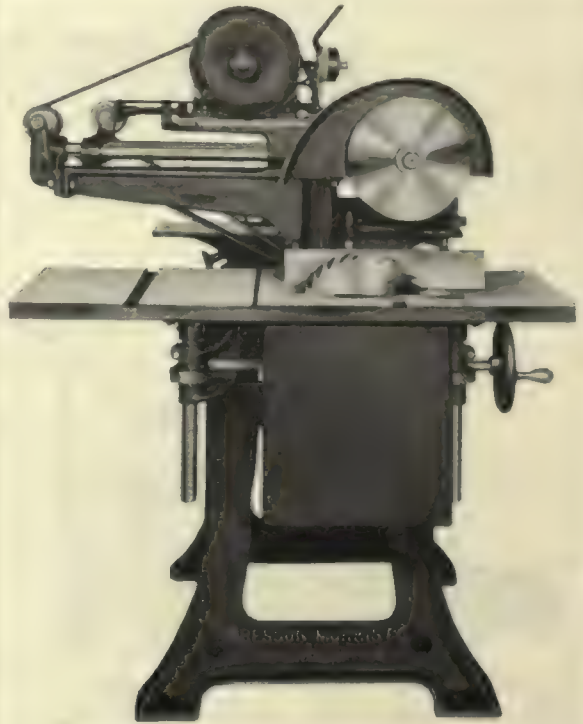
What One Satisfied User Writes Us:

“Referring to your inquiry relative to performance of the circular saw which we purchased recently, wish to advise that this saw has been most satisfactory.

Our Finishing Department advises that on steel moulding for inside car trim we can make as many as 75 cuts per hour. One saw is used without resharpening for ten hours on most of the mouldings. The cost of resharpening is \$.70.

One man can cut as much moulding in one hour as he previously did by hand in ten hours, producing much better surfaces and better fits.”

This concern is nationally known for its excellent car and bus bodies



—Become definite assets to railway and bus shops

USED BY THESE REPRESENTATIVE ORGANIZATIONS:

J. G. Brill Co.
 Pennsylvania R. R. Co.
 Chicago, Milwaukee &
 St. Paul R. R. Co.
 Illinois Central R. R.
 Co.
 American Car &
 Foundry Co.

... and there are many definite reasons for this. The 20th Century Woodworker successfully performs the functions of five standard machines.

It will cross-cut at any angle. With it, you can do Ripping, Jointing, Boring, Dadoing, Plowing, Sanding, Mitering, Rabbeting, Tenoning, Grinding, Stair-Routing, Shaping—you can make Jack Rafters and Moulding. In fact, its uses are almost unlimited.

This machine takes but little space and is almost instantly made ready for any operation. Furnished with gasoline or electric drive. Easily made portable.

You can capitalize the versatility and economy of the 20th Century Woodworker. Adapt it to your problems . . . now!

TWENTIETH CENTURY SALES AGENCY

1321 Arch Street, Philadelphia

Write for illustrated booklet explaining how you can save money with this machine.

CONSOLIDATED DOOR OPERATORS

Door operating equipment for every type of car and bus

*Pneumatic and Electro-Pneumatic Control
and automatic treadle operated doors*

Special Safety Features



Standard Gear Type
Folding Door En-
gine.



Differential Door
Engine — direct
drive.



Standard Gear Type Door
Engine for sliding doors op-
erated through jack shaft.



Consolidated Automatic
Treadle Operated Doors.



Standard Gear Type Differ-
ential Door Engine for buses.



Standard Gear Type Door Engine
for large sliding doors.

**Maximum
Service—
Minimum
Attention**



Standard Gear Type Door Engine for
small or medium sized sliding doors.

**Maximum
Safety—
Minimum
Parts**

Over 20 years' experience in door operating engineering is at your service

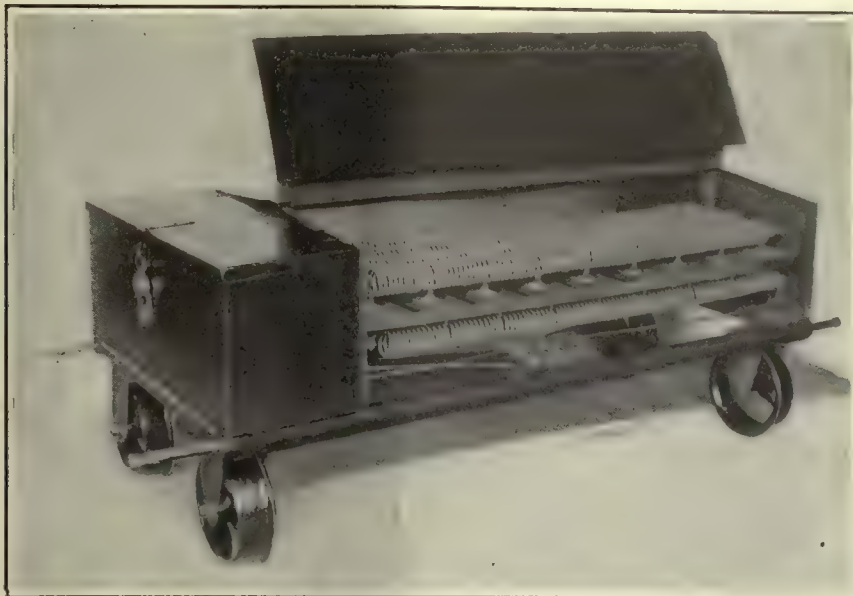
CONSOLIDATED CAR-HEATING CO.

NEW YORK

ALBANY, N. Y.

CHICAGO

An Innovation!



New SBR *All-In-One Brazed Bonding Outfit*

A complete brazed bonding outfit *in one unit*—ample storage space for all bonding equipment—simple—portable—a real bonding innovation—that's the new Erico SBR.

There are a lot of new variations. Resistance wire wound on 2 in. diameter mandrels—maximum ventilation, no overheated wire, no burned out coils.

Frequent spacing of supports adds strength to coils—no sagging.

Pure mica insulates coils from frame—is unaffected by conditions of moisture or heat. An improved method, electrically

efficient, mechanically right, insulates wheels from tracks.

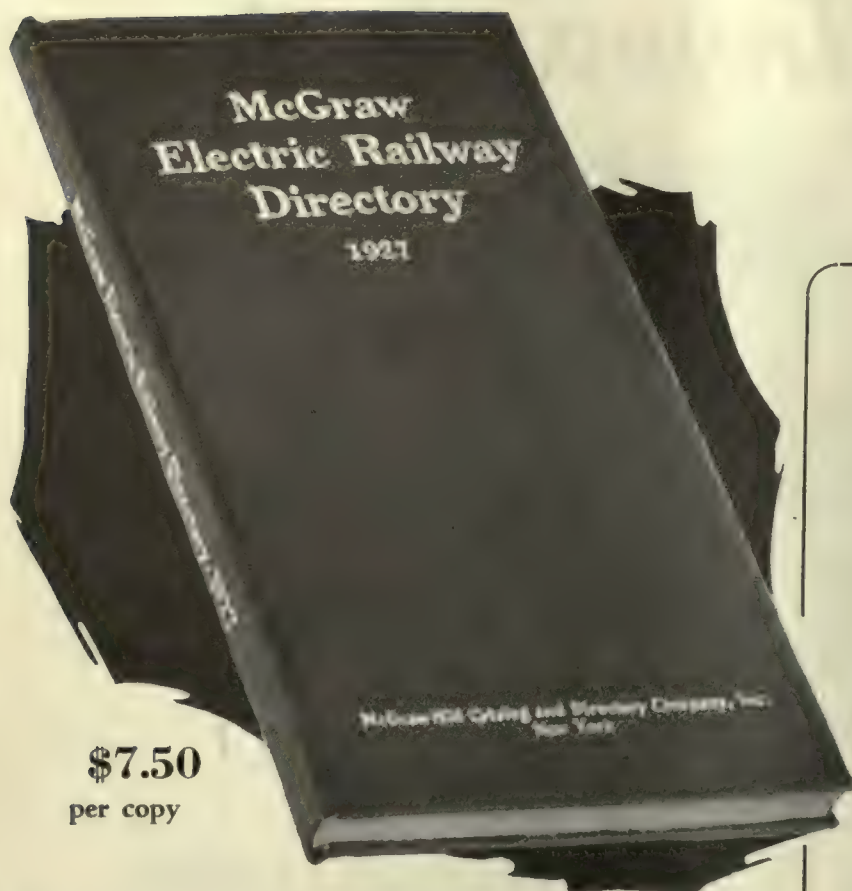
Convenient receptacles at the rheostat's side provide correct current regulation at high or low voltages. And—

The entire frame is covered with a rust proof coating, impervious to weather or changes in operating temperature.

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PARTIAL LIST OF CONTENTS

A complete directory of the electric railway companies in the United States, Canada, Mexico and the West Indies.

Names and addresses of officials and principal department heads, including purchasing agents, master mechanics, supt. of power plants, etc.

Names of subsidiary bus companies.

Names of principal communities reached by each company.

Names and addresses and officers of affiliated holding or controlling companies and lists of properties controlled by each.

Location of repair shops.

Location and the total capacity of power plants.

Mileage of the road, owned, leased and trackage rights.

Gage of track.

Number and kind of cars used.

Number of buses operated.

Number of garages, capacity and their location.

Rates of fare.

Transmission and trolley voltages.

Officers and executive committees of Electric Railway Associations.

Commissioners and principal assistants of National and State Railway and Public Utility Commissions.

Alphabetical list of electric railway officials, giving company connections.

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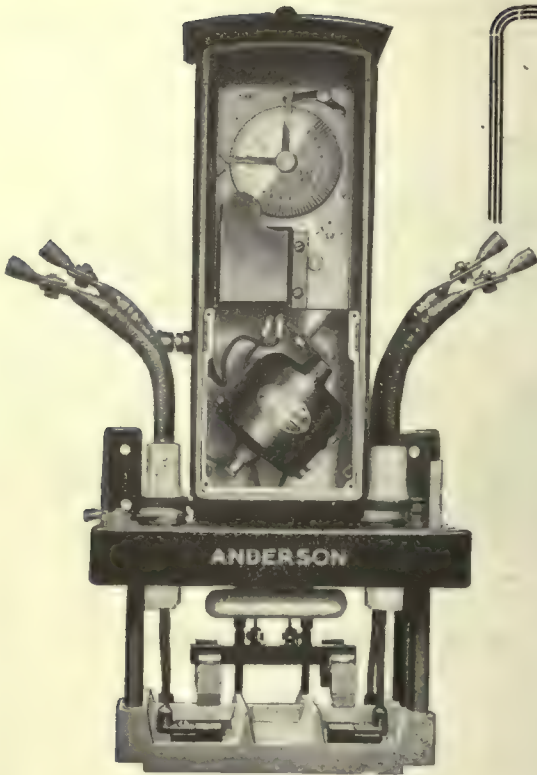
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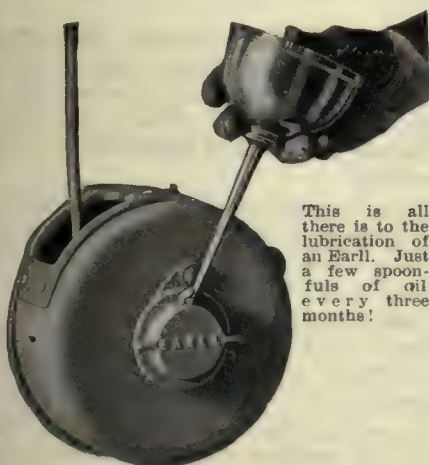
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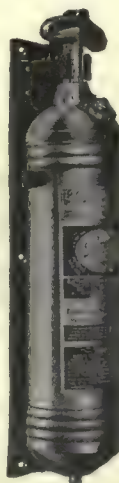
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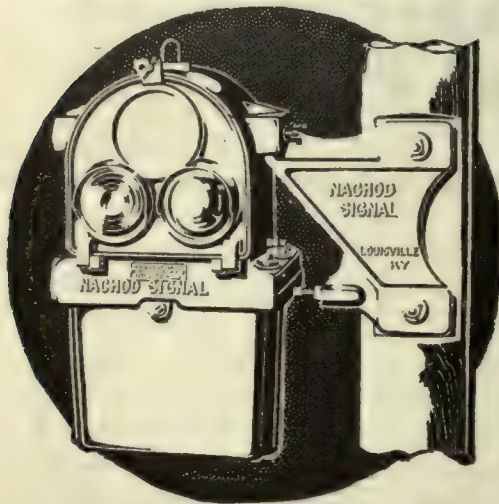
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Gifford-Wood WAGESAVER Street Ice Leveler, operated from boom on derrick car, leveling ice on street outside of tracks. Cumberland Light and Power Co., Portland, Me.

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STREET ICE LEVELER

Does more work than 100 men!

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Levels ice between rails. Cuts out the humps between wheel ruts in street outside of rails.

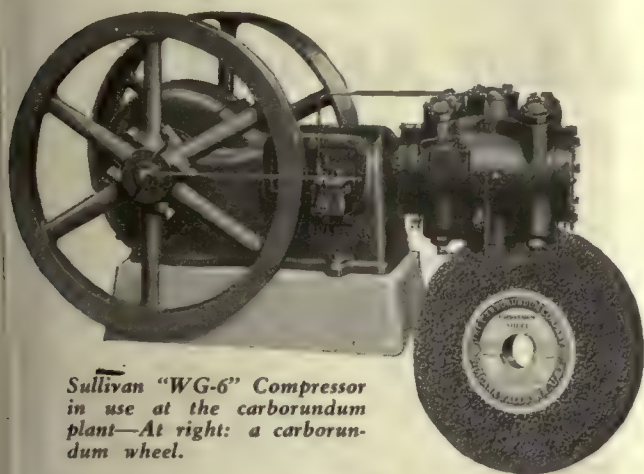
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Sullivan "WG-6" Compressor in use at the carborundum plant—At right: a carborundum wheel.

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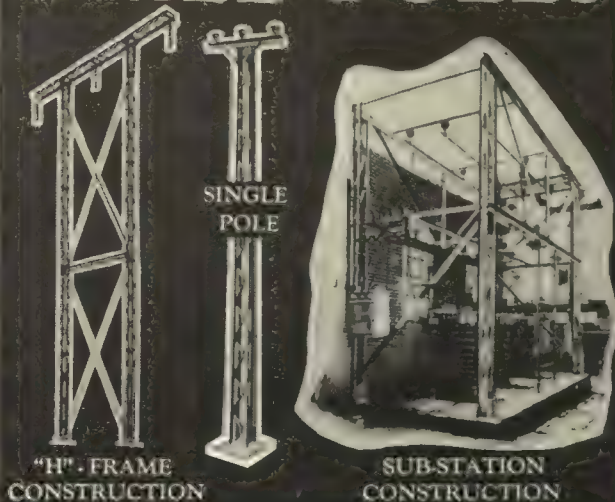
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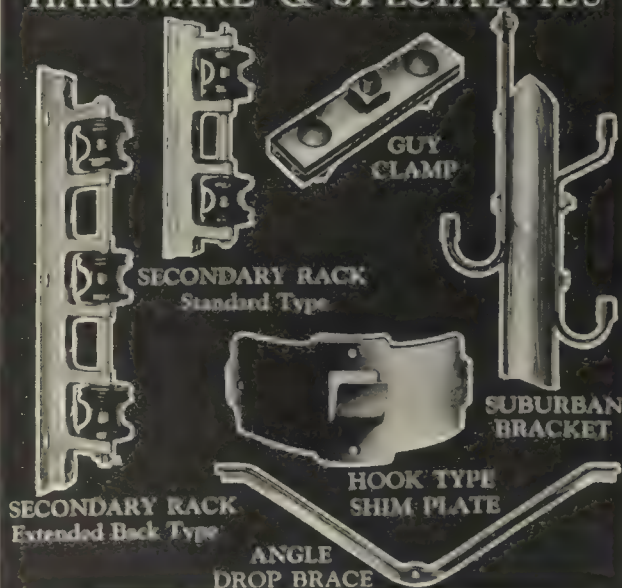
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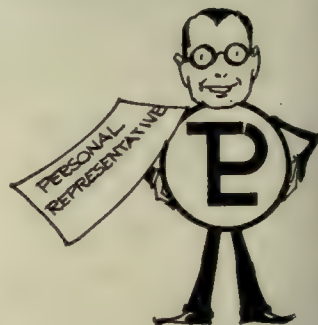
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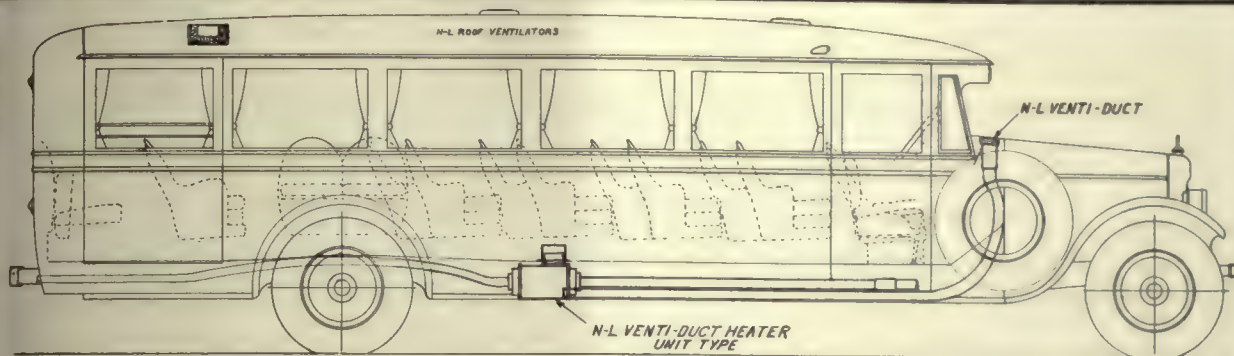
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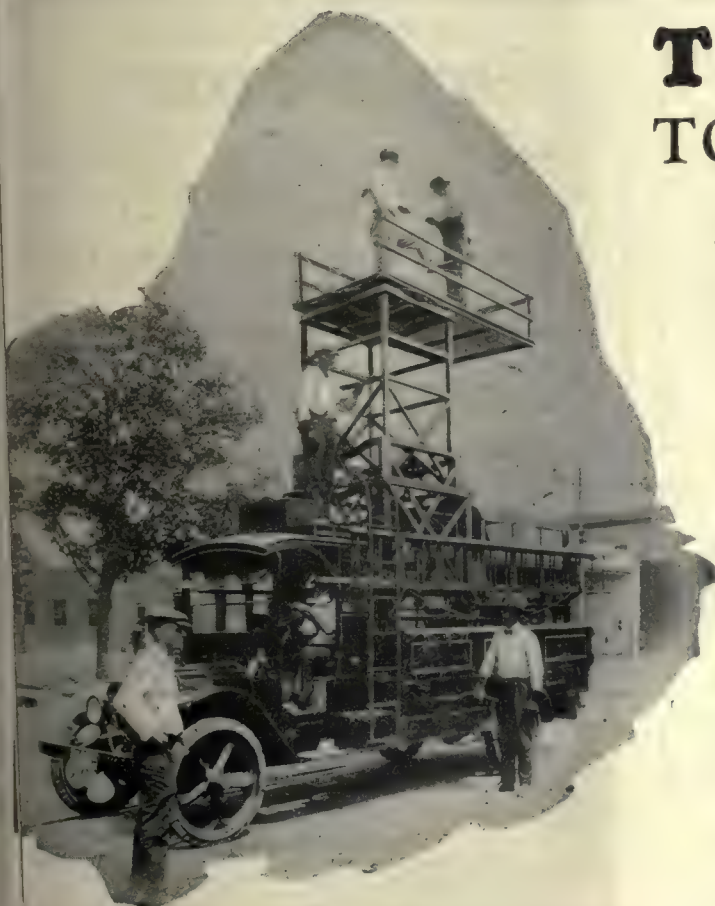
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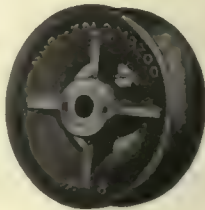
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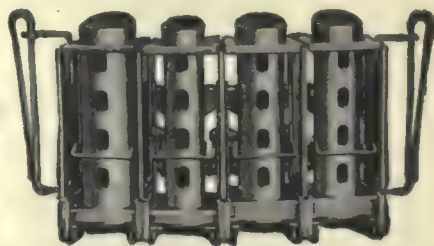
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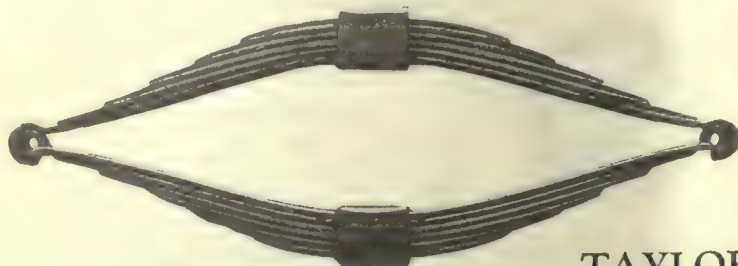
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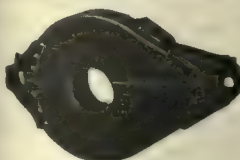


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Best for Service — Durability and
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WANTED—Shop foreman of ability and experience to take charge of modern equipment of twenty cars in city of 50,000 within 100 miles of New York City. State age, experience and salary expected. Address, Room 1509, 43 Cedar Street, New York City.

"SEARCHLIGHT" IS Opportunity Advertising

- to help you get what you want.
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Take Advantage Of It

For Every Business Want

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G-36

POSITIONS WANTED

SUPERINTENDENT transportation, qualified by wide experience, fine record in city and interurban operation and coordination rail and bus service. Exceptional ability in dealing successfully with labor, public, public officials, resulting in increased revenue, reduced operating costs. A progressive efficient operating official with high grade references. Correspondence invited. PW-49, Electric Railway Journal, Guardian Bldg., Cleveland, Ohio.

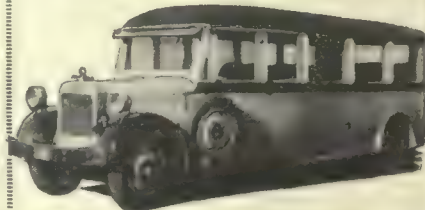
WOULD like to correspond with any company needing a high-grade official in any capacity, in city or interurban railways. Can manage any or all departments in the most efficient manner. PW-38, Electric Railway Journal, Guardian Bldg., Cleveland, O.

CORRESPONDENCE solicited with managers that are in need of an experienced equipment supervisor, one who has proven that he can maintain all types of cars and busses in an attractive and reliable condition at minimum of cost, a good organizer, a man who is loyal and one that works in harmony with all departments, references, past and present employers. PW-40, Electric Railway Journal, 7 So. Dearborn St., Chicago, Ill.

AGENCY WANTED

Agency Wanted for Germany and Austria. A German engineering company, in existence for more than 20 years, well acquainted in a business way with all of the street and interurban electric railways in Germany and Austria would like to take the agency in these countries of an American manufacturer of electric railway equipment or to represent several non-competing lines. Can supply the best references as to financial standing and sales ability. AW-50, Electric Railway Journal, Tenth Ave. at 36th Street, New York.

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For Quick Disposition

- 6—Union McKinnons, Parlor Car Type 19 Pass.
- 3—Fageols, Street Car Type. 29 Pass.
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All in first class condition—dual rear tires—some with extra tires

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If there is anything you want—

or something you don't want that *other* readers of this paper can supply—or use—advertise in the

SEARCHLIGHT SECTION

Somebody is always looking for something to meet certain business needs. Some men in charge of plant operations may be in the market for good used equipment—others may have just what they want, to sell. Some may require a man of unusual quali-

fications for a particular position—that man may be another reader of this paper!

Put the Searchlight Section to work for you under any of the following classifications—to fill your business needs.

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Business Opportunities
Civil Service Opportunities
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Educational Courses
Employment Agencies
Exchanges
For Rent Items
Franchises
Industrial Sites

Miscellaneous Wants
New Industries Wanted
Partners Wanted
Patents For Sale
Patent Attorneys
Plants For Sale
Positions Vacant

Positions Wanted
Property For Sale
Receivers' Sales
Representatives Wanted
Salesmen Wanted
Work Wanted
Etc., Etc., Etc.

WHAT AND WHERE TO BUY

Equipment, Apparatus and Supplies Used by the Electric Railway Industry
with Names of Manufacturers and Distributors Advertising in this Issue

Advertising, Street Car
Collier, Inc., Barron G.
Air Brakes
Westinghouse Air Brake Co.
Air Receivers & Aftercoolers
Ingersoll-Rand Co.
Air Springs
Cleveland Pneumatic Co.
Anchors, Guy
Elec. Service Supplies Co.
Ohio Brass Co.
Westinghouse E. & M. Co.
Appraisals
American Appraisal Co.
Armature Shop Tools
Columbia Machine Works
Elec. Service Supplies Co.
Automatic Door Equipment
Manganese Steel Forge Co.
Automatic Return Switch
Stands
Ramapo Ajax Corp.
Automatic Safety Switch
Stands
Ramapo Ajax Corp.
Axles
Bemis Car Truck Co.
Bethlehem Steel Co.
Brill Co., The J. G.
Carnegie Steel Co.
Cincinnati Car Co.
St. Louis Car Co.
Standard Steel Works
Taylor Electric Co.
Westinghouse E. & M. Co.
Axles, Front
Shuler Axle Co.
Babbitt Metal
National Bearing Metals
Corp.
Babbitting Devices
Columbia Machine Works
& M. I. Co.
Barges, Steel
American Bridge Co.
Badges and Buttons
Elec. Service Supplies Co.
International Register Co.
Batteries, Dry
Nichols-Lintern Co.
Batteries, Storage
Willard Storage Battery Co.
Bearings, Ball
Norma Hoffman Co.
S. K. F. Industries
Bearings and Bearing Metals
Bemis Car Truck Co.
Brill Co., The J. G.
Cincinnati Car Co.
Columbia Machine Works
& M. I. Co.
General Electric Co.
National Bearing Metals
Corp.
St. Louis Car Co.
Taylor Electric Co.
Westinghouse E. & M. Co.
Bearings, Center and Roller
Side
Cincinnati Car Co.
Columbia Machine Works
Stucki Co., A.
Bearings, Roller
Hyatt Roller Bearing Co.
Norma Hoffman Co.
S. K. F. Industries
Bells and Buzzers
Consolidated Car Heating
Co.
Bells and Gongs
Brill Co., The J. G.
Cincinnati Car Co.
Columbia Machine Works
& M. I. Co.
Elec. Service Supplies Co.
St. Louis Car Co.
Benders, Rail
Railway Trackwork Co.
Bodies, Bus
Brill Co., The J. G.
Cummings Car & Coach Co.
Fitzjohn Mfg. Co.
Lang Body Co.
St. Louis Car Co.
Body Material, Haskellite and
Fylmet
Haskellite Mfg. Corp.
Boiler Tubes
National Tube Co.
Babcock & Wilcox Co.
Bolster Hanger Wear Plates
Manganese Steel Forge Co.
Bolts, Nuts & Rivets
Russell, Burdall & Ward
Bond Testers
American Steel & Wire Co.
Electric Service Supplies Co.
Bonding Apparatus
American Steel & Wire Co.
Electric Ry. Improve. Co.
Elec. Service Supplies Co.
Ohio Brass Co.
Railway Trackwork Co.
Una Welding & Bonding Co.
Bonds, Rail
American Steel & Wire Co.
Electric Ry. Improve. Co.
Elec. Service Supplies Co.
General Electric Co.
Ohio Brass Co.
Railway Trackwork Co.
Una Welding & Bonding Co.
Westinghouse E. & M. Co.

Brackets and Cross Arms
(See also Poles, Ties,
Posts, etc.)
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Bates Expanded Steel
Truss Co.
Columbia Machine Works
Elec. Ry. Equipment Co.
Elec. Service Supplies Co.
Hubbard & Co.
Ohio Brass Co.
Brake Adjusters
Brill Co., The J. G.
Cincinnati Car Co.
National Ry. Appliance Co.
Westinghouse Tr. Br. Co.
Brake Shoes
American Brake Shoe &
Foundry Co.
Bemis Car Truck Co.
Brill Co., The J. G.
St. Louis Car Co.
Taylor Electric Co.
Brake Testers
National Ry. Appliance Co.
Brakes, Brake Systems and
Brake Parts
Bemis Car Truck Co.
Brill Co., The J. G.
Cincinnati Car Co.
Columbia Machine Works
& M. I. Co.
General Electric Co.
National Brake Co.
Safety Car Devices Co.
St. Louis Car Co.
Taylor Electric Co.
Westinghouse Tr. Br. Co.
Brakes, Magnetic Rail
Cincinnati Car Co.
Bridges, Steel
American Bridge Co.
Brushes, Carbon
General Electric Co.
Jeandron, W. J.
LeCarbone Co.
Stackpole Carbon Co.
Westinghouse E. & M. Co.
Brushes, Wire Pneumatic
Ingersoll-Rand Co.
Brushholders
Columbia Machine Works
Buildings, Steel
American Bridge Co.
Bulldozers
Haskellite Mfg. Corp.
Bunkers, Coal
American Bridge Co.
Buses
Cummings Car & Coach Co.
Graham Bros.
International Harvester Co.
Six Wheel Co.
Versare Corp.
White Company
Yellow Truck & Coach Co.
Bus Lighting
National Ry. Appliance Co.
Bushings, Case Hardened
and Manganese
Bemis Car Truck Co.
Brill Co., The J. G.
Cincinnati Car Co.
Columbia Machine Works
St. Louis Car Co.
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Cables)
Cambrie Tapes, Yellow and
Black Varnish
Irrington Varnish & Ins.
Co.
Carbon Brushes (See
Brushes, Carbon)
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Elec. Service Supplies Co.
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Consolidated Car Heating
Co.
Westinghouse E. & M. Co.
Car Steps, Safety
Cincinnati Car Co.
Irving Iron Works
Car Wheels, Rolled Steel
Bethlehem Steel Co.
Cars, Dump
Brill Co., The J. G.
Differential Steel Car Co.
St. Louis Car Co.
Cars, Gas-Electric
Brill Co., The J. G.
General Electric Co.
Westinghouse E. & M. Co.
Cars, Gas, Rail
Brill Co., The J. G.
St. Louis Car Co.
Cars, Passenger, Freight,
Express, etc.
American Car Co.
Brill Co., The J. G.
Cincinnati Car Co.
Cummings Car & Coach Co.
Kuhlman Car Co., G. C.
St. Louis Car Co.
Thomas Car Works, Perley
A.

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Electric Equipment Co.
Cars, Self-Propelled
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General Electric Co.
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or Copper
Anderson Mfg. Co., A. J.
& M.
Cincinnati Car Co.
Columbia Machine Works
& M. I. Co.
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Corp.
Castings, Gray Iron and
Steel
American Brake Shoe &
Fdry. Co.
American Bridge Co.
American Steel Foundries
Bemis Car Truck Co.
Columbia Machine Works
& M. I. Co.
St. Louis Car Co.
Standard Steel Works
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General Electric Co.
Ingersoll-Rand Co.
Sullivan Machinery Co.
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Sullivan Machinery Co.
Compressors, Air, Portable
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Crossings, Trolley
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Railway Trackwork Co.
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Railway Trackwork Co.
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Fences, Woven Wire & Fence
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Acme Wire Co.
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Cincinnati Car Co.
Consolidated Car Fender Co.
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Wood Co., Chas. N.
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Haskellite Mfg. Corp.
(Continued on page 128)



CC-35 Paving Breaker—a non-rotating, hard-hitting, one-man compressed air tool that is used for cutting through hardpan, asphalt, concrete, etc.

Reduce Traffic Interference

Street repair work must be fast. With Ingersoll-Rand Portable Air Compressors and Paving Breakers on the job, it is fast. Not only can the work be done more quickly, but fewer men are required.

I-R Paving Breakers are designed to cut through the asphalt surface and break up the concrete sub-base. One of these hard-hitting, one-man tools will do the work of twelve men working with hand picks.

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Let us tell you about the savings to be made with portable compressors and compressed air tools. Full and authentic data will be sent upon request.

Type 20 Portable Compressor

This sturdy machine is a self-contained air power plant that is always ready to go to work. There are six sizes, each of which will operate various combinations of Ingersoll-Rand Air Tools.

Write for a copy of "100 and 1 Ways to Save Money with Portable Compressors." This 140-page book will be sent free to anyone interested.

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 Standard Steel Works
Frogs & Crossings, Tee Rail
 Bethlehem Steel Co.
 Ramapo Ajax Corp.
 Wm. Wharton, Jr. & Co.
Frogs, Track (See Track Work)
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Insulating Varnishes
 Irvington Varnish & Ins. Co.
Insulating Varnishes
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 Bemis Car Truck Co.
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 Dixon Crucible Co., Joseph
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- Bates Expanded Steel Truss Co.**
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Rail Welding
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Rails, Steel
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 Cleveland Pneumatic Co.
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 Brill Co., The J. G.
 Hubbard & Co.
Shovel, Power
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 Consolidated Car Heating Co.
 Elec. Service Supplies Co.
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Signals, Indicating
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 Wood Co., Chas. N.
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Tampers, Tie Ingersoll-Rand Co.	Tower Wagons & Auto Trucks J. E. MacCardell Co.	General Electric Co.	Turbines, Steam Westinghouse E. & M. Co.	Brake Co.
Railway Trackwork Co	Trucks Metal & Thermit Co.	American Steel & Wire Co.	Turbines, Steam Westinghouse E. & M. Co.	Window Guards & Fittings Cincinnati Car Co.
Tapes and Cloths (See Insulating Cloth, Paper and Tape)	Railway Trackwork Co.	Anaconda Copper Min. Co.	Turbines, Steam Westinghouse E. & M. Co.	Wire Rope
Tee Rail Special Track Work Ramapo-Ajax Corp.	Buda Company	Bridgeport Brass Co.	Turbines, Steam Westinghouse E. & M. Co.	American Steel & Wire Co.
Telephones and Parts Electric Service Supplies Co.	Columbia Machine Works & M. I. Co.	Roebbling's Sons Co., J. A.	Turbines, Steam Westinghouse E. & M. Co.	Roebbling's Sons Co., J. A.
Telephone & Telegraph Wire American Steel & Wire Co.	Ramapo Ajax Corp.	Trucks, Car Bemis Car Truck Co.	Turbines, Steam Westinghouse E. & M. Co.	Wires and Cables
Testing Instruments (See Instruments, Measuring Testing, etc.)	Trackless Trolley Cars Brill Co., The J. G.	Brill Co., The J. G.	Turbines, Steam Westinghouse E. & M. Co.	Acme Wire Co.
	St. Louis Car Co.	Cincinnati Car Co.	Turbines, Steam Westinghouse E. & M. Co.	Aluminum Co. of America
	Transfer Tables American Bridge Co.	Cummings Car & Coach Co.	Turbines, Steam Westinghouse E. & M. Co.	American Brass Co.
	Transformers General Electric Co.	St. Louis Car Co.	Turbines, Steam Westinghouse E. & M. Co.	American Electrical Works
	Westinghouse E. & M. Co.	Taylor Electric Co.	Turbines, Steam Westinghouse E. & M. Co.	American Steel & Wire Co.
		Trucks, Motor International Harvester Co.	Turbines, Steam Westinghouse E. & M. Co.	Anaconda Copper Min. Co.
		White Company	Turbines, Steam Westinghouse E. & M. Co.	Bridgeport Brass Co.
		Truck & Body Bolster Center Trains	Turbines, Steam Westinghouse E. & M. Co.	General Electric Co.
		Manganese Steel Forge Co.	Turbines, Steam Westinghouse E. & M. Co.	Okonite-Callender Cable Co.
		Haskelite Mfg. Corp.	Turbines, Steam Westinghouse E. & M. Co.	Inc.
		Okonite Co., The	Turbines, Steam Westinghouse E. & M. Co.	Roebbling's Sons Co., J. A.
		National Tube Co.	Turbines, Steam Westinghouse E. & M. Co.	Westinghouse F. & M. Co.
			Turbines, Steam Westinghouse E. & M. Co.	Wood Cutting Machines
			Turbines, Steam Westinghouse E. & M. Co.	Twentieth Century Sales Corp.
			Turbines, Steam Westinghouse E. & M. Co.	Wood Preservatives
			Turbines, Steam Westinghouse E. & M. Co.	American Creosoting Co.



One of these cars exhibited
in Cleveland



No. 301 Type

Rockford wanted Modern Cars and specified Brill Seats

A unique feature of the last seven cars built by the American Car Company for Rockford was the use of Brill No. 301 type leather upholstered seats of a distinctive color in each car.

This popular double-chair seat for single-end cars has loose cushions of both air and spring type mattress construction, and contributes no small part to the success of electric railway service in which they are introduced.

BRILL

BRILL

Interurban Passenger

C. E. R. A.
Standard
Freight
Car

Motor Freight Car

100
per cent
New
Cars

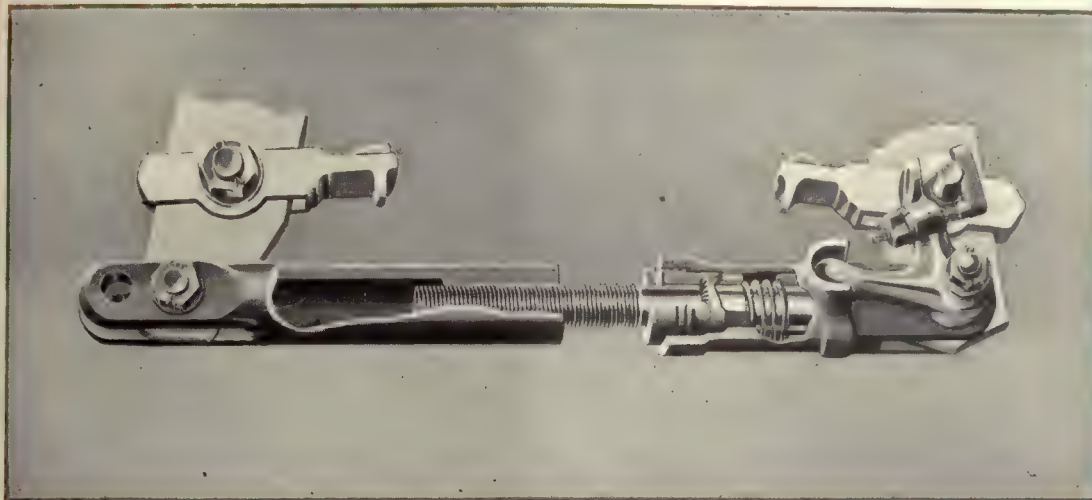
All built by Kuhlman

The modern tendency is to place in service new cars, scientifically designed, with adequate provision for the public's comfort, convenience and safety. Increased interest in electric railway service is manifested with the introduction of new cars. That's why the Cincinnati, Hamilton & Dayton confidently rehabilitated its service with 100 per cent new equipment.

Cincinnati
Hamilton &
Dayton Ry.

BRILL

BRILL

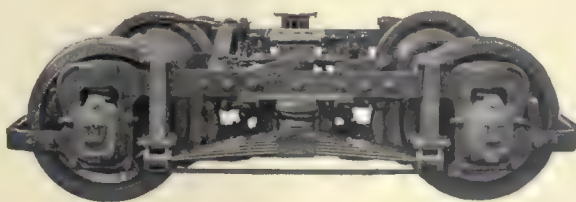


Announcing Brill Automatic Slack Adjuster

(Mechanical) (Patented)

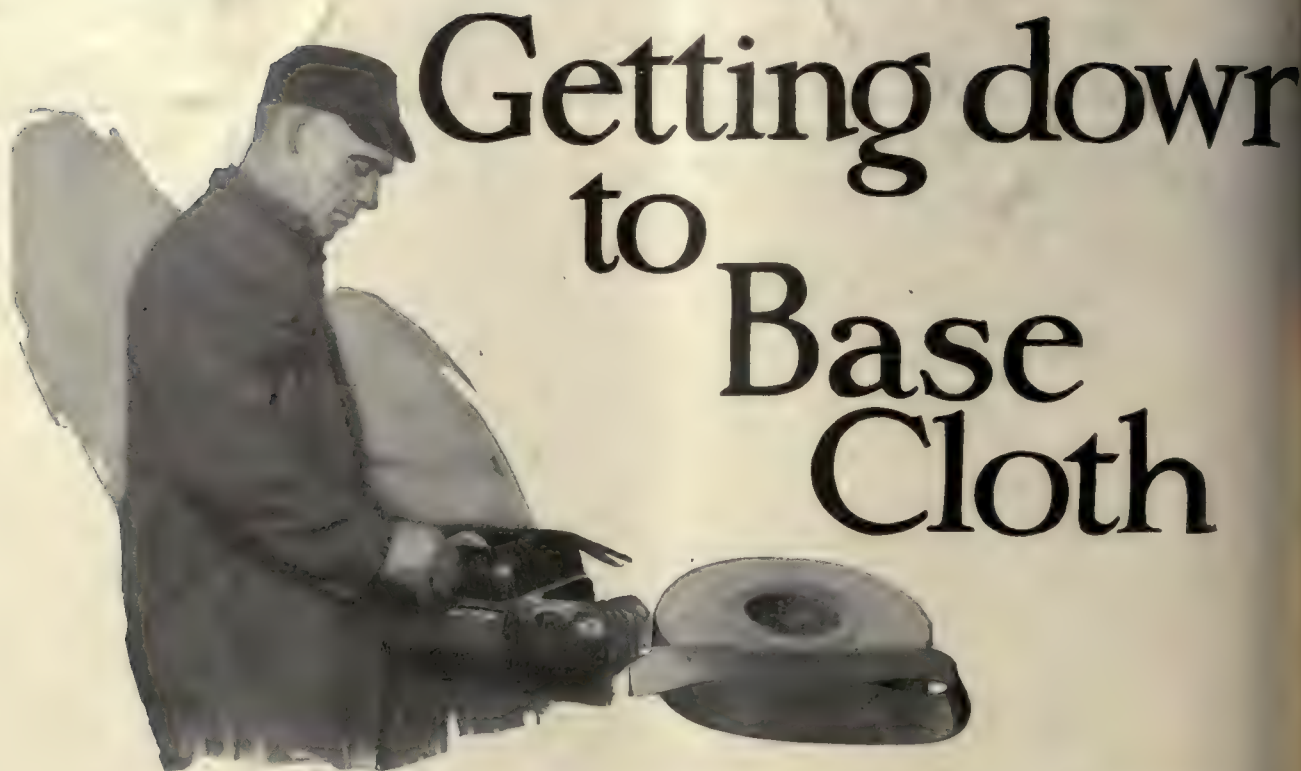
A mechanical slack adjuster which, while comparatively new, has been thoroughly tested and proven its merit in the automatic adjustment of brakes during the life of the

brake shoes. An opportunity for inspection of this new development was afforded delegates to the A. E. R. A. Convention in Cleveland.



Like the Brill 177-E Truck—"Recommended by Proven Merit"

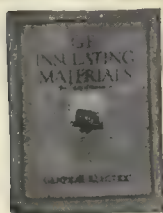
BRILL



Two cloths which look alike on the surface may not be the same inside—and that's where the protection begins. G-E Varnish-treated Cloths and Tapes are made from a base cloth which is starch and acid free. No fillers are added which might prevent thorough penetration by the treating varnishes. This good base cloth is then given a chance to absorb G-E Insulating Varnishes and naturally holds an exceptionally high percentage of varnish.



IN THIS CATALOG



a complete listing of the following G-E Insulating Materials. Write for it.

Insulating Varnishes
Finishing Varnishes
Insulating Oils
Stickers
Shellacs
Paints
Filling Compounds
Sealing Compounds
Varnish Treated Cloths
Varnish Treated Cloth Tapes
Insulating Fibers
Insulating Papers
Flexible Varnished Tubing
Motor Tubing
Asbestos and Cotton Tapes
Friction and Rubber Tapes
Prepared Paper Tapes
Cords and Twines

The entire process was developed to produce treated cloth of *continued high dielectric strength* under actual service conditions. If you want uniformly dependable material the same as used in General Electric equipment, specify G-E Varnish-treated Cloths and Tapes.

G-E Treated Cloth Tape

These tapes are cut from our Varnish-treated Cloths and are therefore of the same high quality. Any desired width from $\frac{1}{2}$ inch up in all necessary thicknesses. Colors—black and yellow.

A G-E Merchandise Distributor near you will be glad to give you prompt service. His stocks are complete and you can order *all* G-E Insulating Materials through the one source.

WRITE FOR CATALOG



Insulating Materials

GENERAL ELECTRIC

MERCHANDISE DEPARTMENT, BRIDGEPORT, CONNECTICUT

ELECTRIC RAILWAY JOURNAL

Law Hill Publishing Company, Inc.

October 15, 1927

Twenty Cents per

HOUSTON PUBLIC LIBRARY,
HOUSTON, TEXAS

Anticipating Every Trend

THE 40-PASSENGER

ALL-STEEL Q. C. F. METROPOLITAN COACH

reveals the full possibilities of real mass transportation by motor coach—typifying Q. C. F. progressiveness in significant coach developments.

THE Q. C. F. PARLOR-OBSERVATION COACH

brings the Industry protected, curb-level baggage and express space—brings “Premium Seats”—and brings further evidence of Q. C. F. ability to create outstanding revenue-attraction.

THE Q. C. F. EXPRESS SPECIAL

points the way to de luxe, high fare, high-revenue Urban operation—an Q. C. F. development which is the first real challenge to private cars!

THE COMPLETE Q. C. F. LINE

demonstrates that universal revenue-transportation experience inevitably results in higher net income from coaches of any type.



AMERICAN CAR AND FOUNDRY MOTORS COMPANY
30 CHURCH STREET, NEW YORK CITY



HIGH brush mileage is dependent, among other things, on the fit of the brush in the box.

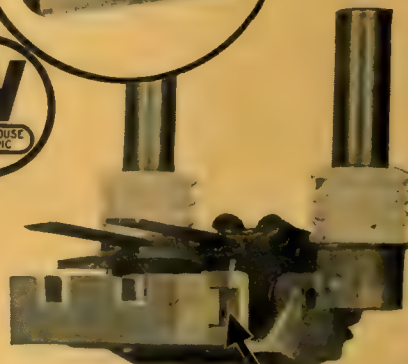
With the continuous movement of the brush, the box is bound to wear.

To hold correct carbon box dimensions at a nominal cost, the Westinghouse detachable box brushholder has been designed.

This construction permits the use of a hard bronze metal in the carbon box without greatly increasing the cost and makes it possible to detach and renew the carbon box when worn.

Why scrap the whole brushholder to renew the carbon box!

Westinghouse Electric & Manufacturing Company
East Pittsburgh Pennsylvania
Sales Offices in All Principal Cities of
the United States and Foreign Countries



Cut off
Carbon Box
Expense
Here

Westinghouse

X91104

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Vol. 70
No. 16

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Bringing to Light an

Industrial Romance

AN INDUSTRIAL romance which should thrill the spirit and fire the imagination of every red blooded railway man lies between the pages of the twelve briefs filed in this year's Coffin Award contest, according to Ex-President Sawyer, who testified on Advisory Council night in Cleveland to his reactions in reading the presentations of the several contestants.

The value of these briefs as sources of inspiration to the entire industry has continued to increase each year since the award was founded. In recognition of this value, the JOURNAL has made it a yearly custom to digest for publication in its columns the new practices and methods which have been found successful by the Coffin contestants.

Again this year, the JOURNAL will render this service to its readers. Forthcoming issues will unfold the story of progress as reflected in the practices of these twelve properties that Mr. Sawyer characterized as "Beacon lights that should lead us on our way." Watch for these Coffin brief stories. They contain many ideas for improvement that have been tested in the crucible of practice.

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American Machinist

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Coal Age News

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Electric Railway Journal

Electrical World

Industrial Engineering

Electrical Merchandising

Radio Retailing

Construction Methods

Electrical West

(Published in San Francisco)

American Machinist—European Edition

(Published in London)



BETTER RAIL, BETTER TRANSPORTATION

You can get the proper fare

Again we quote Editor Gordon:

“Give your riders a taste of really modern transportation and all the politicians in town can’t keep you from getting the proper fare to support it.”

Modern service is comfortable, swift, silent and safe.

Nothing you do will provide such service unless you first put your track in good condition.

Track rejuvenation is the logical start—Take the first step first. Grind out corrugations. Build up and level the joints.

Here is the equipment that makes a little money go a long way toward providing modern service.

Bulletins?

Railway Trackwork Co.

3132-48 East Thompson Street, Philadelphia

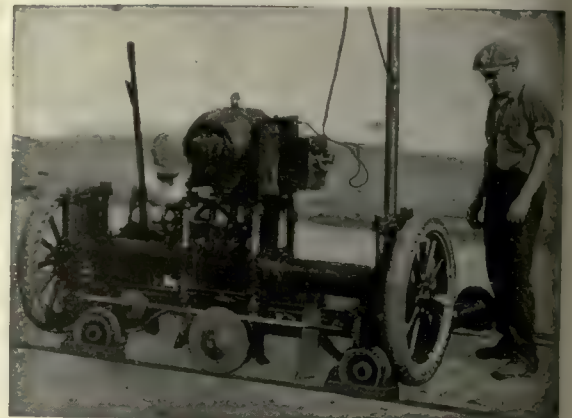
AGENTS:

Chester F. Gallor, 30 Church St., New York
Chas. N. Wood Co., Boston
Electrical Engineering & Mfg. Co., Pittsburgh
H. F. McDermott, 208 S. LaSalle St., Chicago
P. W. Wood Railway Supply Co., New Orleans, La.
Equipment & Engineering Co., London
Fraser & Co., Japan

⊕ 1951



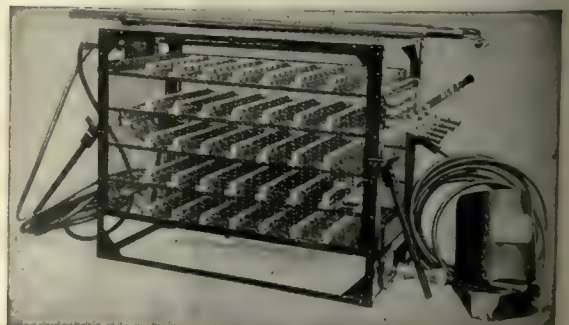
Eureka Radial Rail Grinder



Vulcan Rail Grinder



Reciprocating Track Grinder



"Ajax" Electric Arc Welder

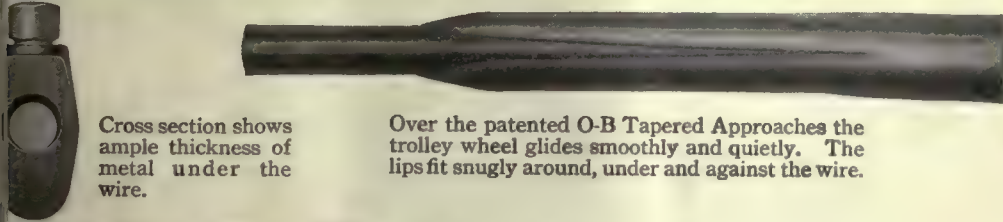
BETTER RAIL, BETTER TRANSPORTATION

WEATHER

now storms today and tomorrow



DOLLARS and SENSE!



O-B Type C Splicer, patented. Made for round, grooved and Fig. 8 wire in all sizes. O-B Catalog Page 542.

Cross section shows ample thickness of metal under the wire.

Over the patented O-B Tapered Approaches the trolley wheel glides smoothly and quietly. The lips fit snugly around, under and against the wire.

500 Trolley Breaks in a Storm Area on a Single day!

Statistics of the industry as a whole reveal a split-up of the average fare as illustrated below. The net income is only 5.7%. Just one percent saved from the 69.5% now devoted to operating expenses would make the net 6.7%—an increase of nearly 20%.



EACH one means delay and disruption of schedules—delayed and disgruntled passengers—creation of public condemnation of street railway service. *Unless*—the damaging effects of unavoidable trolley breaks are minimized by forehanded preparation for such emergencies.

Wire breaks need not tie up traffic for any length of time—need never occur in the same place—if you have a stock of O-B Splicers on hand ready for use in a pinch.

They go into place and stay there. Their holding power exceeds the strength of new wire. The trolley wire enters in a straight line, without a kink—which means without a weak spot. In a few moments the line is up again, ready for traffic.

Be prepared. Put in *your* stock of O-B Splicers now. Write or wire

Ohio Brass Company, Mansfield, Ohio
Dominion Insulator & Mfg. Co. Limited
Niagara Falls, Canada
707B

Ohio Brass Co.



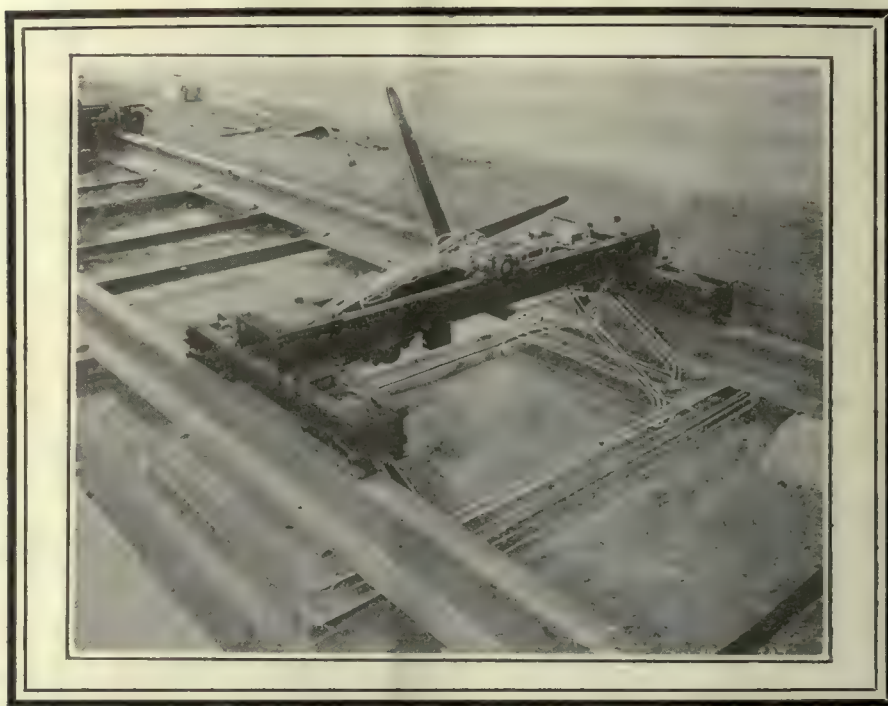
SALES OFFICES: NEW YORK CHICAGO

PHILADELPHIA PITTSBURGH CLEVELAND
SAN FRANCISCO LOS ANGELES

PORCELAIN
INSULATORS
LINE MATERIALS
RAIL BONDS
CAR EQUIPMENT
MINING
MATERIALS
VALVES

ANNOUNCEMENT

Two New Machines for Paved Tracks
at the 46th Annual AERA



THE D-S-R TRACK LAYER

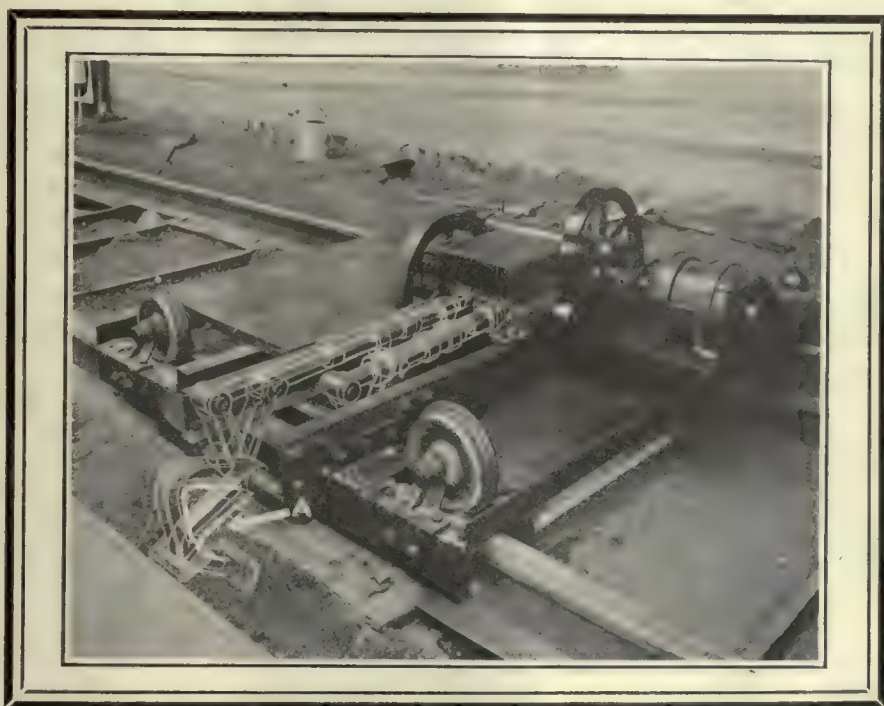
One man can now fasten Twin Ties to the rail applying any type of fasteners complete, in a part of the time formerly required by four men. This machine is simple, sturdy, and can be carried to the rails from the work car by four men. A simple toggle action operated by hand lever actuates the grab hooks which lift the tie from the subgrade to rail base. Total lift 7 inches. Photograph shows phantom view of machine in raised and lowered positions.

The International
CLEVELAND

STEEL TWIN

UN CING

Construction—shown for the First Time
Convention in Cleveland, Ohio



THE COMPRESSION TAMPER

A machine which applies a new principle to tamping—*compression*. The tamping arms "A," acting simultaneously on opposite sides of the plate on both rails, apply a compressive force of 800 pounds to the concrete, forcing it under the plates and squeezing out all voids and water pockets. The tamping arms have a speed of 20 strokes per minute, giving the machine a theoretical production capacity of 6000 feet per day. Equipped with Hyatt Roller Bearings, 1 H.P. 550 D.C. all weather motor, driving through reduction gear. A punch press type of clutch starts the tamper and can be locked for continuous operation. While the labor saving feature of this machine is notable, the main subject of comment by Engineers during the Convention was the dependability and improved quality of the construction with compression tamping. Photograph shows phantom view of machine with arms at top and bottom of stroke.

Steel Tie Company

OHIO, U. S. A.

TIE TRACK

Would you try to row a boat with one oar?



It can be done, but the inefficiency of steering against the turning effect of the one-sided force is obvious.

Similarly, balanced braking (the double shoe clasp type) is vastly superior to the single brake shoe rigging. The heavy braking load is equally balanced on opposite sides of the wheel. There is no shifting of the journal box bearing; no unbalanced load on truck frames and truck springs; less brake shoe wear; less journal box wear; fewer hot boxes; fewer slid-flat wheels; smoother and shorter stops; less train resistance in starting.

In other words, dozens of advantages—all making for economy and better transportation service.



AMERICAN MULTIPLE-UNIT
CLASP BRAKES



AMERICAN STEEL FOUNDRIES

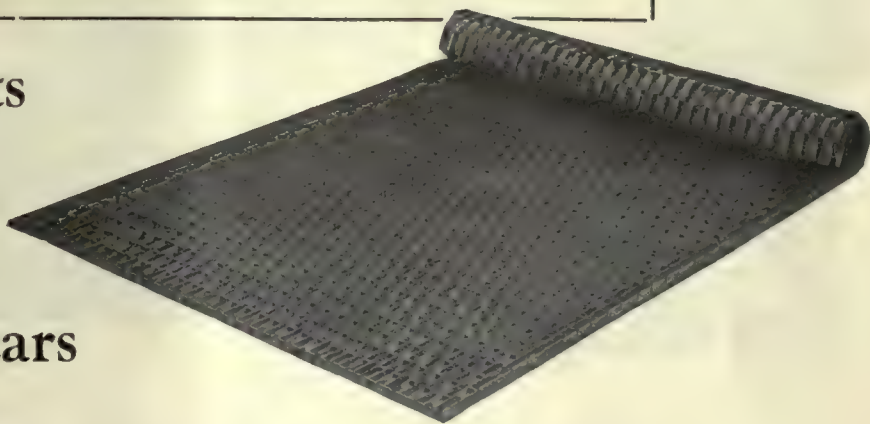
NEW YORK

CHICAGO

ST. LOUIS



Wear-Proof Mats add to interior attractiveness of Kansas City cars



"Upholstered seats, linoleum floor covering, and *flexible matting* in the aisles add to the interior attractiveness."

—From recent issue of *ELECTRIC RAILWAY JOURNAL*

THE *flexible matting* referred to above is Wear-Proof Mat, an ideal floor covering for cars.

Wear-Proof Mats combine safety, sanitation and resiliency with economy. They roll up like a rug and cannot turn up at the edges, nor slip nor warp. They may be used on both sides, have an indefinite life and are absolutely guaranteed for a period of five years under the most extreme service conditions. They are supplied in any rectangular shape and in one or more pieces.

And remember that sure-footed passengers minimize the danger of accidents.

We'll be glad to send you further particulars of Wear-Proof Mats. Write us today.

Home office and plant at 17th & Cambria Sts., PHILADELPHIA;
District offices at 230 So. Clark St., CHICAGO; 50 Church St., NEW
YORK; Bessemer Bldg., Pittsburgh; 88 Broad St., Boston; General
Motors Bldg., Detroit; 316 N. Washington Ave., Scranton; Canadian
Agents, Lyman Tube & Supply Company, Ltd., Montreal, Toronto,
Vancouver.

ELECTRIC SERVICE SUPPLIES Co.

MANUFACTURER OF RAILWAY, POWER

AND INDUSTRIAL ELECTRICAL MATERIAL



Interurban Service



"STANDARD"
Wheels
Axles
Springs
Armature Shafts

STANDARD STEEL WORKS COMPANY

Philadelphia, Pa.

BRANCH OFFICES

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HOUSTON

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MEXICO CITY
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PITTSBURGH

WORKS: BURNHAM, PA.

INDIANA



NP

50 TO 100 TREADLES IN TWELVE MONTHS

FIFTY cars equipped with NP Treadle Exit Doors gave Indianapolis an opportunity to sample treadle service. The trial *must* have given satisfaction, for the treadle installations in this city have been *doubled* in the last twelve months.

NATIONAL PNEUMATIC COMPANY

Executive office, Graybar Building, New York

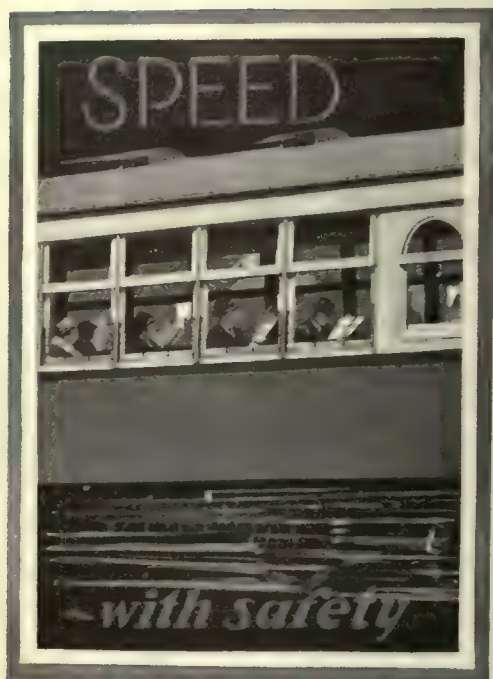
General Works, Rahway, New Jersey

CHICAGO
518 McCormick Building

MANUFACTURED IN TORONTO, CANADA, BY
Railway & Power Engineering Corp., Ltd.

PHILADELPHIA
1010 Colonial Trust Building

Eleven accidents at a total



The Four Features
of balanced design
are the Cardinal
Points of Today's
Demand!

Averted at cost of \$31.55 /

[[This is the first of several "brass tack" advertisements on the subject of CINCINNATI AIR and MAGNETIC BRAKE]]

Thirty-one dollars and fifty-five cents spent for accident prevention. Eleven accidents averted as a direct result of this expenditure!

This, in brief, is the story told by operators' reports and maintenance records on the operation of Cincinnati Duplex Air Magnetic Brakes on a famous Southern property.

The cost figure is for one month's maintenance of the Magnetic Brakes on 41 cars,—an average cost per car of \$.602. During this period eleven motormen's reports definitely stated that more or less serious accidents

were averted only because of the braking efficiency of the Magnetic equipment.

Any one of these accidents might have involved several thousand dollars. Adequate prevention cost only a few cents a car.

In exactly the same way the Cincinnati Duplex Air Magnetic Brake can help YOU speed up schedules and reduce to an absolute minimum your accident reserve!

Full details and technical data on request.

CINCINNATI CAR COMPANY, CINCINNATI, OHIO

[[The Duplex Air and Magnetic Brake is a feature of the Cincinnati Balanced Lightweight Car]]

CINCINNATI BALANCED LIGHTWEIGHT CARS



Keeping Abreast of the Traffic Stream

HOW to speed up traffic through congested areas is a problem confronting many street railway companies today. Such a problem can be solved by a better brake—a quicker acting brake—a brake that is as effective on loaded cars as on empty cars.

The Westinghouse Variable Load Brake will better traffic conditions because—

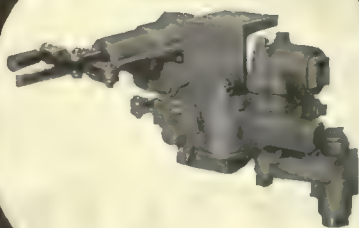
It maintains the maximum braking ratio substantially constant throughout the range of passenger loading, by an automatic adjustment of cylinder pressure as the car weight changes.

It makes the brake action independent of main reservoir fluctuations, as the maximum cylinder pressure for a loaded car corresponds to the minimum governor setting.

It decreases the time of brake application and release, and makes possible a higher rate of retardation, because the maximum braking ratio is obtainable with a lower cylinder pressure.

The uniformly short stops thus made possible are reflected in greater safety and faster service during congested periods—cars are able to keep abreast of the traffic stream.

Perhaps this brake has the potentiality for solving your transportation problem.



WESTINGHOUSE TRACTION BRAKE Co.

**GENERAL OFFICES AND WORKS
WILMERDING, PA.**

The Westinghouse Variable Load Brake is now being used by a score or more of traction properties on over 1500 cars



Prepare now for Snow!

This nimble and versatile snow fighting unit will eliminate blockades on car lines or bus routes.

Exhibited at the Convention this year, the Cummings Gas Electric Drive Snow Sweeper made a decided impression on all who inspected it. Its great utility in clearing snow from locations inaccessible to rail sweepers was at once apparent. It will be found very advantageous in removing snow from tracks in front of car barns, and from bus routes, both in cities and on highways.

When operating as a sweeper, the rear cab is used by the driver, and the machine runs broom foremost.

Gas Electric Drive gives independent control of broom and vehicle speeds.

By removing broom and rear cab, the machine is converted into a utility truck, suitable for construction and repair work, thus rendering service the year round.

Designed and Built by

CUMMINGS CAR AND COACH CO.

111 W. Monroe Street
CHICAGO

THE SPIRIT OF ST. LOUIS



is
the
Sp



irit of Progress ~

Because to stand still is to go backward—because there is a dynamic force which presses forward—St. Louis Quality Shops are far from having reached a climax in car improvement and development.

Any objectives thus far achieved—and you have had an opportunity to study some of them at Cleveland—are merely milestones along the path of progress. They merely serve to indicate that St. Louis has gone a

long way in bringing transportation up to date and in popularizing the street railway.

St. Louis could not halt now. The forward movement has just started. The great strides already taken not only vindicate our confidence in the industry's future but quicken our pace in the never-ending march forward.

Cleveland was an inspiration—but only a sample of what the next year holds in store.

St. Louis Car Co.





Through specific figures, facts are revealed. Experience of a few years with modern light-weight cars, both city and interurban, has furnished convincing proof that new revenues can be developed and substantial savings effected.



A significant page from recent Illinois Traction history

In 1924 this company replaced its 94,000-lb. interurban cars, operated on the Illinois Valley Division, with new 37,000-lb. one-man cars and decreased its headway from 2 hours to 1 hour. The financial gain realized in 1925 from operating these modern cars, which are all equipped with G-E Motors and Control, is indicated by the following facts:

Although two more city cars were operated on the system than in 1923, there was a reduction of 33% in the shop force.

Even with an increase of 70% in interurban passenger car mileage, operating expenses were less by \$39,000.

On account of the more attractive cars and reduction in headway, passenger revenue increased \$33,000—the total savings, therefore, being about \$72,000 or a gross return of about 39% on the investment.

Of 22,239 trains operated in 1923, 92% were on time; in 1925 the number of trains increased to 32,858, of which 97% were on time.

The comparative operating costs per car-mile for accounts affected by the new cars are:

	1923	1925	Saving per C. M.	% reduction
Equipment	3.60	0.95	2.65	73
*Power Purchased	5.80	3.35	2.45	42
Platform expense	5.17	3.75	1.42	27

*All service



This achievement in improving service and lowering costs of operation is another instance of the success of modern G-E Car Equipment. For these new Illinois Traction cars, G-E-265 Motors with K-35 Control were selected.

GENERAL ELECTRIC

GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y., SALES OFFICES IN PRINCIPAL CITIES

Electric Railway Journal

Consolidation of Street Railway Journal and Electric Railway Review

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Influence of the Coffin Award Continues to Grow

THIS issue is abstracted the brief of the Grand Rapids Railroad that won the Coffin Award for 1927. As was pointed out in the report of the award committee, the accomplishments set forth in the brief are those of a comparatively small property in an industrial community of approximately 160,000 population, the class of city in which the effects of automobile competition are felt the strongest. It is among railway properties of this size that there is shown a serious dropping off of revenues in many cities.

Again in the words of the committee, the practices and accomplishments of this property have had a widespread influence on the entire industry and have done much to awaken the present almost universal interest in the improvement of electric railway service. With limited facilities, on its own initiative, and largely with its own resources, the Grand Rapids Railroad, which was scarcely known outside of its own city a few years ago, undertook to demonstrate to the world the process of popularizing electric railways by the improvement of equipment and service. The present awakened interest in the development of cars, which was permeated to all the manufacturers and to almost every operating company in the country, was given a strong impetus by the pioneering of this comparatively small company.

This year's Coffin contest was particularly outstanding in the excellence of the presentations made by practically all the contestants, and by the spirit of progress and determination evidenced by each of the competing companies. There was a wide difference in the size and character of the twelve properties and consequently it was an extremely difficult task to apply a common measuring stick in determining the relative value to the industry of their various accomplishments. It is particularly difficult, in comparing large with small properties to judge the relative weight to be given size and complexity on the one hand, in comparison with limited resources, personnel and facilities on the other.

Each year the committee has testified to the difficulty of its task, but has endeavored to make its decisions in the light of what it considered the best interests of the industry and the spirit of the award conditions. That a comparatively small property should win out in the face of competition by properties many times its size should inspire the entire industry with confidence in the sincerity with which the contest is judged, though it is obvious that an earnest and unsuccessful contestant may end by questioning the committee's decision. This year's result in particular should inspire every property that has pointed the way, through its practices toward the development of electric railway transportation for the convenience of the public and the benefit of the industry, to enter the contest, regardless of how modest its resources. It is significant that this is the second time the win-

ning company has competed for the award, the first effort having been unsuccessful. The spirit in which the award can be made of greatest service to an individual property and to the industry is illustrated by the Northern Texas Traction Company, which, although already once a winner, has filed five successive briefs in the competition in the conviction that the very act of preparing such a brief is more than worth the effort and cost involved. While joining with the rest of the industry in congratulating the Grand Rapids Railroad Company on its success, the JOURNAL voices the hope that some of this year's other contenders, who according to the committee's report presented a formidable array of accomplishments, will again enter the contest in the spirit of helping to stimulate that general improvement of the industry which was in the minds of the founders of the award.

Now That the Convention Is Over

NOW that more than a week has elapsed since the close of what is perhaps the greatest and most remarkable convention ever staged by the local transportation industry, we can look back on it in better perspective. As we view thus the kaleidoscopic exhibit and program, its many separate and diverse elements blend into general impressions from which we can begin to interpret the significance of what we saw and heard.

What, then, is the greatest single idea that comes out of the convention? What is the one thing that seemed to impress itself on every man's mind, both those who have spent their lives in the local transportation business and those who were merely observers of the industrial drama that unfolded in Cleveland? What outstanding thought did the Cleveland delegate carry away with him, consciously or unconsciously, that he did not have when he arrived?

Perhaps a good way to express it would be to say that the industry, for the first time in many years, gave unmistakable evidence of being "sold" on itself. In every meeting and in every conference men spoke out with a note of optimism in their voices. The whine of defeat, which unfortunately has been in evidence in some railway meetings during past years, was entirely absent. Men talked about how to go ahead faster, not whether it was possible to go ahead. Executives listened to criticism of past practices, and nodded their heads in obvious agreement. Everyone seemed to be eager for new ideas. Those who were lulled into a condition of hopelessness on the assumption that they had done everything possible to better the situation of their properties were either absent entirely or kept their thoughts to themselves.

Again and again, one recurring thought rang out, "The industry has only taken a forward step; it has only started!" When a man or an industry sees as many new things and hears as many new things as were in evidence

in Cleveland, and receives them with the statement that "we have only started," then indeed is that man or that industry on the road to progress.

So to repeat, Cleveland sold the industry on itself. There was unmistakable evidence that the last word has by no means been written on the possibilities of the street car in meeting present-day conditions. Local transportation men came away from this greatest of all exhibits with a broadened perspective of what can be done in the way of merchandising transportation. When they returned to their properties, practices which had a few days before seemed to be the last word faded, in many instances, into comparative mediocrity. The experience was probably similar in many respects to that of the visitor to an automobile show a few years ago, who upon returning home looked over the old "bus," which with its new coat of paint had looked "pretty classy" only that very morning.

Sales psychology and sales thinking is a comparatively new thing for electric railway men. They have been using the words for several years, but at Cleveland many acquired for the first time a real grasp of their meaning. The next few months will demonstrate whether or not they have yet acquired the power to translate these new impressions into action.

Half a Billion in Ashes!

FIRE last year exacted the staggering toll of 10,000 lives and a \$560,000,000 property loss, the latter representing \$1,066 worth of property destroyed every minute in the year. This was more than sufficient reason for a whole-hearted observance of Fire Prevention Week, which has just closed. The best observance—one that will last infinitely longer than a week—will come through a serious study of means to check this demon, which is conceived in carelessness.

The consequences of fire in the electric railway industry are perhaps more appalling than in any other industry which contributes to a nation's welfare and happiness. In our case it is not a question of hastily securing other quarters, ordering new standardized machinery, or, as is generally the case, throwing the burden of supply upon another factory or a competitor. Once street railway equipment is destroyed there arises a civic calamity that strikes deeply, a calamity the effects of which time alone can obliterate. The public and the utility can only stand and wait. Insurance may be the balm, but it is certainly not the speedy cure. Street cars and buses are rarely carried in stock.

The seriousness of the fire risk in this field was brought home recently when 25 cars of the Ottawa Electric Railway went up in smoke. The cause given was defective wiring. In a few minutes this company's emergency equipment was destroyed. A great metropolis was robbed of one of its vital civic factors. The remaining rolling stock will now have to bear a 100 per cent overload, perhaps more. Congestion and inconvenience to the public will result. The company must wait for new equipment to be manufactured. There is no other recourse. Granted that it were possible to borrow from some of its neighbors, such action would be robbing Peter to help Paul.

With such an example before us there can be only one case where fire in the electric railway field is justifiable, i.e., the public application of the torch that destroys

obsolete equipment that has already been replaced by new. Let us bear this in mind during the year to come. The Chinese employ a doctor to keep them well. Apply this method to the question of fire loss, then prevention will become the infallible cure.

Engineering Association's Committee Reorganization Completed

WHEN the reorganization of committee work in the Engineering Association was begun several years ago, during the administration of President R. C. Cram, it was more or less in the nature of an experiment. Accordingly, only the committees treating of way and structures subjects were regrouped according to the proposed plan. The result was so satisfactory that last year the new grouping was extended to include rolling stock subjects. With the opening of the new association year, the power subjects have been consolidated into a third division, and two other committees that have been functioning independently have been logically placed in their respective groups. A very few committees that do not fall within the new grouping are still retained, but aside from these all the technical committee work has been placed in the divisions of way and structures, rolling stock and power.

According to the plan, standing committees have been appointed to head up the activities in the three groups. These committees are continuing, one-third of the members being appointed each year. Thus there is a continuity in the personnel which is valuable for the advice and guidance it can give in following the activities of the various special committees in the group. The old standards committee has been relieved of work in connection with these three groups, as the respective standing committees pass on standards, subject, as in the past, to the approval of the executive committee. Consideration of standards will thus be in the hands of men who are experts on their subjects, rather than a general group of whom but few are specially qualified to evaluate the proposals advanced by the special or sub-committees.

A very evident advantage of the new organization was seen in the working out of the Cleveland convention program. Instead of taking up the entire time of the sessions with presentation and discussion of committee reports, only one day was needed. The remaining two afternoons were free for outside speakers, and the time was effectively used, several valuable addresses being made.

Building Sound Fundamentals for the Future

WORK that has attracted little general attention, but which is nevertheless of the greatest importance to the local transportation industry and to the development of American cities, has been going quietly and steadily forward during the past three years. This year the job will have been carried as far as the present development of the art and the state of mind of the public will permit. When the committee on rapid transit made its report to the association there was completed a service to the industry and the public the value of which it may take many years adequately to demonstrate.

On this very important subject of rapid transit, the electric railway industry is now in the happy position of building for the future. The membership of the com-

Committee includes various schools of thought. These members are by no means agreed on the many phases of the rapid transit problem. They have, however, been able to present the fundamentals of transit from its several angles, all approached from the broad viewpoint of the community's best interests. The several annual reports of the committee constitute what is undoubtedly the most thorough digest available of this important subject.

It has been the committee's object to guide the thought of the industry and the public along sound and constructive lines. The mistakes that have been made in those communities that were forced into rapid transit construction without an adequate understanding of transit economics have cost taxpayers, investors and riders undreamed millions. The situation in New York illustrates the seriousness of rushing into transit construction on a large scale without the establishment first of a definite policy. Even today the country's metropolis seems as far away as ever from the establishment of a transit policy, and in the meantime taxpayers and riders are carrying a constantly increasing back-breaking burden.

The committee seeks to anticipate recurrence of such a situation in other cities that are approaching rapid transit development. It is quite likely that in years to come these reports will be considered among the most constructive pieces of work ever done in the interests of the industry and of community development.

Another Columbus Makes a Discovery

MAYOR WALKER has been traveling again. This time it is in his own New York and in the daytime. The Mayor may know his way unaided to the City Hall, but he had no intention of trusting himself alone to the mysteries of Brooklyn. So on Columbus Day, most fitting after all, he, with Samuel Untermyer, Chairman Delaney of the Board of Transportation and Transit Commissioner Lockwood, made a personal inspection of the rapid transit lines in Brooklyn. To do so the party is said to have traveled 45 miles by automobile and to have stopped at a dozen strategic transit points.

The party discovered a lot, at least the Mayor did. He discovered the maze at Canal Street and that the Brighton Beach line is in a cut. Later he is to make a trip into the Bronx. Compared with Brooklyn, the possibilities of the Bronx and of Queens, the city's fastest growing borough, are about ten to one. Some day he may ride on the lines. Ex-Mayor Hylan did for a while. So did a former public service commissioner. On one occasion they had an appointment to ride downtown together from Brooklyn. The platform on which they were to have met was so crowded at the appointed hour that they didn't discover each other. One came into New York over the Lexington Avenue L and the other over the Broadway line through Canal Street. One saw nothing wrong. The other saw everything wrong. It would be unkind to intimate that they saw only what their respective political positions made it desirable they see.

Mayor Walker, on the other hand, sees a lot of things wrong. Certainly, the newspaper men who talked with him were not disappointed at his statements to them. They seldom are. The gushing Jimmie apparently was at his best. And that means a great deal. Of course, he didn't commit himself on the Untermyer plan. Jimmy is cautious. But he is still for the 5-cent fare. "How could anybody help but like it who has the interests of

the people at heart," he said. And the echo answers, "How could they, especially if they are in a precarious political office and politics is their profession." It isn't a matter of fare, the Mayor says. Not even a dollar fare would help in the present case. The need is for more subways. But there is hope. The Mayor promises to study the transit plans that have been advanced and to comment on them officially when they come before the Board of Estimate. And there's where matters stood on Oct. 13—the Mayor contemplating a trip into the Bronx and promising more comment after the meeting of the Board of Estimate. Again New York apparently is on the threshold of great things transit-wise.

American Association's Scope Broadened

WITHOUT fanfare of trumpets, with comparatively little attention save by those charged with the responsibility, the revisions to the constitution and by-laws of the American Electric Railway Association adopted at the Cleveland convention bid fair to be the most important advance accomplished at that epoch-making meeting. Four principal objects were sought in the changes: (1) To restate the purpose of the association so as to be in accord with present activities of the membership, and to make it possible for responsible transportation operators now barred out to gain admission and take part in its activities; (2) to correlate more effectively the work of the state and sectional associations; (3) to provide for plural voting in certain instances, thus recognizing the proportionate size of member companies; (4) to readjust the financial structure of the association so as to include the office of the managing director.

The changes make it possible for the association to cover the entire field of transportation in local communities, which has been difficult in the past. While so-called independent bus operators may now be admitted, restrictions have been drawn that will prevent the entrance of interests antagonistic to organized community transportation. Thus full recognition of present-day conditions and trends of the industry has been provided.

There are two reasons for the introduction of plural voting. In the adoption of proposals which affect the entire membership, such as engineering standards, there have been instances where the smaller companies have outvoted the larger, although the amount of material to be ordered by the large companies is far greater. As a result some large companies refused to accept the standard, and the purchases of the small ones have been insufficient to obtain for it the recognition of the manufacturers. Under the new arrangement it virtually will be necessary to secure the support of a sufficient number of the large properties to insure the adoption of important changes in standards or the introduction of new ones. Those voting in favor of the proposals will be much more inclined to adopt them than they would had they remained neutral or indifferent. Another advantage of plural voting is that a group of the smaller companies cannot band together to dictate the policies of the association against the interests of the larger ones.

As to the change in financing of the association, it was a logical step that will be of advantage in many ways. In the past, the managing director's office has been supported by subscriptions. Its work has more than demonstrated its value to the industry and the financial simplification is both logical and desirable.



This year's

Coffin Prize Winner

has an international reputation for the fine quality of its cars and of its service in general

1. Looking forward in the Grand Rapids rail coaches. The ceiling is free of obstruction. There are attractive and effective lighting fixtures, leather bucket seats, inlaid rubber tiling on the floor, and inclosed control cabinets.

2. This double door in the front has an inside step well and low steps. The comfortable and neat-appearing seat provided for the operator is shown.

3. The rear-end view of new rail coaches shows the smoking compartment closed off at the rear. It has attracted many lost patrons.

4. Note the skirt which muffles noise and improves the low-hung appearance of the car; also note the manner of naming each car.

5. Looking toward the rear end of the Grand Rapids rail coaches. The smoking compartment is shown back of the bulkhead.

6. Circulation through the car and easy egress are provided by an automatic treadle door at the rear. The double door at each end affords facilities for two-man operation when needed.





This view of one of the new Grand Rapids "rail coaches" gives a very good idea of its inviting appearance, as well as the effective outlook possessed by the operator

Modern Cars Important Factor in Winning Coffin Prize

Grand Rapids Railroad in its presentation for 1927 says its new cars were the backbone of nearly the whole of the recent merchandising and public relations campaigns. The following series of articles in this issue, based upon the Grand Rapids brief, tell the details of the accomplishments

BREADTH of the influence exerted throughout the country by the practices and accomplishments of the Grand Rapids Railroad is cited by the Coffin Award Committee in its report awarding the 1927 Coffin Prize to this comparatively small city property in a community of 160,000 population. With limited facilities, on its own initiative, and largely with its own resources, this comparatively small railway property, which was scarcely known outside of its own city a few years ago, undertook to demonstrate to the world the process of popularizing electric railway service.

In its brief the company frankly says that the major step taken in making possible its accomplishments was the development of its new rail coaches. Their significance, the brief says, goes far beyond a mere contribution to car design and lower operating costs. The primary motive in their development was that of merchandising transportation service. They represent to the public the beginning of a new day in mass transportation. They have been the basis for all the company's merchandising and public relations campaigns. Without them but a small fraction of the progress realized could have been made. In very large measure, the profound change which has taken place in public sentiment toward the company and toward street railway transportation in Grand Rapids is attributed to the popularity of the improved equipment, which has transformed the common attitude toward riding in street cars from one of apology to one of enthusiasm. The cars were the talk of the

city, and, indeed, of the country. Seemingly, all the city, individuals and officials, suddenly found themselves voicing pride in the Grand Rapids railway service.

A striking thing about all this change is that these new cars were only 30 out of 127 on the system. Nevertheless, they developed so much good will that it served to take out of mind the antipathy toward the older cars too.

The main features are the comfort and beauty of soft leather bucket-type automobile seats, mosaic rubber tile floor covering, special illumination, cabinet-inclosed control mechanism, easy ingress and egress, bright colored painting and streamline body with aprons emphasizing the low-hung appearance, notable noiselessness, beauty of large plate glass vestibule windows and illuminated dash. Further particulars of these cars will be found in previous issues of this paper, particularly in that of May 29, 1926.

INFLUENCE OF NEW CARS ON RIDING

The new cars provided practically the complete service on three lines, so it was easy to determine their influence on riding. The three lines equipped with the new cars showed as a whole a substantially larger increase in total revenue than the remainder of the system equipped with old cars. One of these three lines had some decreases, but

it serves many industries, mostly furniture factories, while the two others are residential lines. One of these latter serves the city's best residential section. It was the earliest line to show a decline in earnings with the advent of the automobile. It is now one of the first lines to indicate a return of lost patrons, as the new coaches induce residents to leave their autos at home and take advantage of the comfortable ride on the new cars where they "Relax—Don't Worry."

SPECIAL MEANS OF CREATING TRAFFIC

The method of putting these cars in service indicates that the Grand Rapids company possesses good merchandising ability. When the day came for placing the 27 new rail coaches in service, they were not unceremoniously started on their runs. A parade of the whole fleet was arranged. It afforded a dramatic way of impressing people with an event of very real importance to them. And incidentally, thousands of those who came downtown to witness the well-heralded new cars rode down and back on street cars and swelled the revenue for that day, and for succeeding days, too, for to view the new cars was to desire to try them out. Of course this interest spread rapidly to neighbors and friends, and they rode.

After building toward the big climax with displaying advertising, feature stories, banners and other media, the company announced the date of its now historical street car bonfire and jollification on the West Michigan Fair Grounds, which is at the terminal of one of the company's long lines. Seventeen old cars furnished the funeral pyre. More than 50,000 people jammed into the Fair Grounds to enjoy the free admission, free grandstand seats, band concert, illuminated balloon flight and fireworks display, and to witness Mayor Elvin Swarthout and the company's vice-president apply the torches to either end of the long line of cars that had outlived their usefulness.

As was expected, thousands of autoists motored to the bonfire and were given free rein in parking. At the conclusion of the jollification a situation arose that did more to impress the serviceability and reliability of the street car than reams of advertising could have accomplished. There was an uncontrolled rush by autoists to get their cars out of the grounds. Naturally a tangle jam resulted, and it was two hours before the last autoist left the grounds, shortly after midnight. While this delay to private autos prevailed, railway passengers were promptly started home, the last passengers getting away nearly two hours before the last automobile.

* * * * *

The Prize Winner This Year

What It Is and Has Done

THE Grand Rapids Railroad is exclusively a transportation utility, supplying Grand Rapids, Mich., and immediate vicinity with street car and motor bus service. It comprises 68.4 miles of track, on the single-track basis, which serves approximately 95 per cent of the population, on the assumption that any resident within one-fourth mile of a street car line is adequately served. The company owns and maintains car shops, paint shops, three carhouses, a bus garage, a general information office for the use of the public and an amusement park.

The total number of persons employed by the company on July 1, 1927, was 550. The total number of passenger cars owned and operated by the company is 127, besides the necessary complement of snow-plows, sweepers and other working equipment. The base week-day schedule requires 89 cars and the rush hour 112 cars.

Grand Rapids has a population of about 160,000. Its topography makes operation somewhat difficult. The city is built upon both sides of Grand River, which flows through its center and in close proximity to its business district. Severe hills necessitate tracks on long 9 per cent grades and require very high energy consumption as well as special equipment and operating precautions in the interest of safety.

The main business district is flanked on the west by the river. Three blocks to the east the hills rise abruptly and extend eastward to the fringe of the residential sections. The natural barriers of hills and river have caused the business district to be built practically along one main artery of traffic, Monroe Avenue, through which a great share of the traffic passes. Into this narrow gateway pour thousands of automobiles, taxicabs, trucks and

the tourists on their way to and from northern Michigan resorts. This greatly hampers the speed and regularity of street car schedules, while cross-town traffic over the bridges adds to the perplexity of the situation.

Farther to the north along the banks of the river, between the hills that bound the city on the west and fringe the high land that swings to the northeast, are wide-reaching valleys and undulating uplands through which are found the only transportation avenues. To the south, west, near the shore of the river and in the valley below the Black Hills, nestle many factories.

AN AUTOMOBILE FOR EVERY 3½ INHABITANTS

The eastern, southeastern and mid-west sections are thickly settled, causing a density of population unusual in cities the size of Grand Rapids, and also presenting another trying situation for the railway company. The city has 150 miles of paved streets and more than 100 miles of improved streets not paved. The city's population of about 160,000 lives within an area of approximately 23 square miles, which makes the sidewalks a great competitor of the railway as private automobile. Of the latter 44,829 were registered this year in Grand Rapids—one for each 3.5 residents. Revenue rides per capita for the year ended Dec. 31, 1926, were 116, based on 160,000 population and including rides on both cars and buses.

Grand Rapids is a manufacturing center, and while its industries are fairly diversified, furniture accounts for about 50 per cent of its products in point of value and 50 per cent of the total number employed. Hence, a depression in this one industry has a very appreciable

effect on the business of the railway. Furniture is a seasonal product, and it is one of the first industries in the city to feel business slumps.

MODERNIZATION PROGRAM OUTLINED

The close of the war found this property in much the same condition as other small railways over the country. It was badly run down. Rolling stock was in such poor repair that on many days there were not sufficient cars to fill the regular runs. Little or nothing had been expended in reconstructing track, only enough to maintain service, such as it was. Besides the bad condition of the physical plant, the financial situation was also little short of desperate. Naturally, with the service reflecting these conditions, the public was unsympathetic if not antagonistic.

With faith in the industry and its future, the management set about to rebuild in every way and to re-establish the company in its proper place in the minds of its customers and its investors.

It is noteworthy that this modernization program, spreading over a period of five years, has been carried out step by step in a practical way along the lines recommended by the Federal Electric Railways Commission appointed by President Wilson, and has also comprised in many instances the conclusions reached by various committees of the American Electric Railway Association.

The various steps in this program are best briefed in the chronological order in which each task was undertaken and carried to successful conclusion:

FIRST STEP TAKEN IN 1922

The first major step in the program came with the granting of a new franchise in 1922, the old franchise having expired in 1920. From 1920 to 1922 the railway had operated under a day-to-day permit, which was very unsatisfactory.

In a remarkably short time, as securing of franchises goes, a 30-year service-at-cost franchise was secured, 75 per cent of the voters giving it their approval, though in prospect of a lower fare was offered. This franchise safeguarded the company's interests by providing for the elimination of jitneys and other competitive motor vehicle transportation. It embodied the right to earn an 8 per cent return on the investment. Its adoption aided in gaining relief from unjust taxes in the form of sprinkling expense and salaries of traffic policemen. A necessary step in securing this franchise was a revaluation fair to both company and city. The book value of the property was written down from \$8,571,580 to an agreed valuation for rate-making purposes of \$5,500,000. All major provisions of the new grant were in accord with the recommendations of the Federal Electric Railways Commission.

FIVE-YEAR BUILDING PROGRAM UNDERTAKEN

The fine support of the public in approving the franchise prompted the company to go forward with its plans at once for improvement of the physical condition of the property. This rebuilding program naturally covered the renewal and rebuilding of rolling stock and the reconstruction and extension of tracks in conformity with the transit plan adopted by the city. It also included the abandonment of certain track where duplication of service existed.

A five-year building program was laid out and from 1922 to 1926, inclusive, \$1,633,044 was expended, which

is equal to 50 per cent of the total value of track and roadway at the time reconstruction work began. During this period property to the value of \$833,381 was retired from service, of which 12 per cent was due to duplication of service. All new money required for this construction program was secured without outside assistance.

It was during 1923, when serious consideration was being given rehabilitation of equipment, that preliminary plans were laid for a new design of cars. These came to fruition in 1926 when 27 new "rail coaches" were put in operation, as mentioned on page 782.

FINANCIAL IMPROVEMENT FOLLOWED NEXT

The next step undertaken was a financial one, involving the reissue of bonds to replace those maturing in 1924. In that year \$3,700,000 matured and a new issue was made. Notwithstanding the general uncertainty with which traction securities were looked upon and the precarious position of electric railways generally, this issue was entirely subscribed within an hour after it was placed on the market. This event did not merely happen. Dillon, Read & Company acted as brokers and only took the issue after their engineers had made repeated and exhausted study on the property. A feature of their report was the suggestion that the very strong public relations position of the company gave these securities an uncommon worth.

This refunding was carried out without change in the capital structure, another evidence of the confidence and returning good will of the people and investors toward the Grand Rapids company.

During 1924 a schedule department was established, resulting in economies through decreased man-hours and car-miles and increased running speed.

On July 19 fire destroyed the Hall Street carhouse and 57 cars. This disastrous loss was taken advantage of to promote the new type of electric coach for which plans had been partially completed. This course of action meant that it would be necessary to operate old and obsolete borrowed equipment for the time necessary to bring the new cars into operation, but the public, taken into the confidence of the management and fully advised of the circumstances, gave its hearty support and waited with unusual patience until the new coaches were placed in service.

TEST CARS REVOLUTIONIZED DESIGN IDEAS IN 1925

In the early spring of 1925 delivery was made of three test coaches which had been worked out with the co-operation of three car builders, in accord with the design proposed by the railway.

In view of the somewhat radical changes which had been made in design, it was deemed advisable to make a thorough test of these three cars to determine the relative merit of the innovations, with a view to adopting a final composite design of car which would incorporate all of the features found to have merit. The aim was to provide a light-weight car which would carry a new appeal in comfort and appearance.

In order to keep the industry advised as to the progress made, these cars were taken to Atlantic City for exhibition purposes at the annual convention of the A.E.R.A. The enthusiasm with which they were received gave evidence of the industry's approval of the company's effort to furnish the public rides comparable with those in automotive vehicles.

After these cars had been in service during the year,

a composite design of coach was evolved incorporating those features which had shown up well in the test period and had proved to be salient in the sale of transportation. Plans were completed and orders placed to equip three lines.

IMPROVEMENT PROGRAM REACHED CLIMAX IN 1926-1927

The rehabilitation of the physical property of the railway company reached a climax in June, when 27 new electric coaches were delivered. These cars were placed in regular service and almost immediately increased car riding was enjoyed, confirming the expectations of the company that the new idea in cars would create increased car riding as well as effect decreased operating expenses. The biggest return, however, was the intangible value of the reaction upon the public. This was particularly helpful just at this time as it thus became easier and more popular for the City Commission to work with the company.

The first six months of the year 1927 have seen the culmination of the crowning accomplishment in the program, as affecting the financial future of the company. This was the revamping of the financial structure, very much along the lines recommended by the advisory committee on finance, A.E.R.A., 1925.

It is the belief of the management that, with continuance in the betterment of the physical property and with the financial structure of the company reorganized and placed on a substantial footing, the future of the railway company is now assured both from the standpoint of its investors and the public.

The reorganization of the Grand Rapids Railroad was undertaken in the interest of the holders of preferred stock, to re-establish credit and permit reduction of the fixed charges, which had been too great a burden. It provided for the extinguishment of \$600,000 of bonded indebtedness and reduced the annual cash outlay \$140,000. The immediate results obtained and the ultimate benefits which will be derived from this reorganization are given in detail elsewhere.

During the months that have gone by in the year 1927 the rehabilitation program as outlined has been steadily carried forward and the results have been very gratify-

ing. During 1926 the total operating expense was \$1,108,709, as compared with \$1,172,157 in 1925, a reduction of \$63,447, or 5.41 per cent. The inauguration of the electric rail coaches has resulted in increased popularity of car riding. This is shown by an increase in gross revenue from \$1,738,779 in 1925 to \$1,776,758 in 1926, an increase of 2.18 per cent. This increase is the more remarkable because the coaches did not go into operation until the middle of June, 1926.

In general, this extensive five-year rehabilitation program has resulted in economy of operation, improved service, improved earnings, a profound improvement in public good will, and has gained for the Grand Rapids Railway widespread recognition in the transportation field. This brings the company to the place now where it has laid out and is embarking upon a new ten-year program of betterment and construction, which should shortly bring the property up to and maintain it in a virtually 100 per cent condition.

* * * *

Car Named After Colonel Lindbergh

Prize-winning company accedes to request of Grand Rapids Flying Club to act as sponsor for coach named after noted aviator

THE practice of naming electric railway cars after distinguished local citizens is followed in Grand Rapids as well as in some other cities. Grand Rapids has gone a step farther, however, and on Sunday, June 19, 1927, one of its electric rail coaches was dedicated to Col. Charles A. Lindbergh. A suggestion for this ceremony was conveyed to the officers of the Grand Rapids Flying Club, in the belief that it would be in keeping with the spirit of the time and strengthen the efforts of the club to gain greater public support for the local airport. The club agreed.

Accordingly, a request was made by the Flying Club,



The Lindbergh car shows what can be done to make rebuilt Birney cars attractive, comfortable and less noisy



The Grand Rapids "Colonel Lindbergh" car carried appropriate front decorations and the operator was dressed in flying costume. The air propeller over the coupler was removed when the car was put in operation

through its president, to the railway management to permit the club to sponsor such a coach at a public dedication. A coach was being rebuilt in the company's shops at the time, and to take advantage of this opportunity it was promptly decorated to serve this purpose. News stories and advertising informed the public of the event, which was held at Ramona Park at 5 p.m. This hour was chosen so as not to conflict with a public concert in the John Ball Park at the end of another car line, where during the early afternoon the Elks Band played for the first time in Grand Rapids "The Spirit of St. Louis."

At 2 p.m., to accommodate the public, the Lindbergh coach was placed on public exhibition and inspection. More than 2,000 people passed through and praised it during the hours until the dedication.

The ceremony was also broadcast by the local radio station, WOOD. Several thousand people crowded about the car during the ceremony and airplanes from the local airport flew low overhead and dropped flowers on the coach. Of course telegrams were sent by the Flying Club to Colonel Lindbergh and his mother telling them of the dedication in his honor. An attractive album of photographs of the event, autographed by the president of the club, Mayor Swarthout, Association of Commerce officials and others, was sent to the Colonel.

A feature of the Lindbergh coach was the attire of the car operator, who will be known as "pilot" instead of chauffeur. He wore for this occasion the regulation one-piece flying uniform with goggles and helmet, in keeping with the atmosphere of the coach.

The new coach, harmonizing with the quality of the company's new rolling stock, is made unusually attractive by the outside decorations, which include the name of Colonel Lindbergh, the flying insignia with American shield and star signifying a senior aviator. The panels are illuminated with artistic reproductions of Lindbergh's famous airplane, "Spirit of St. Louis." An unusual but very appropriate decoration was an 8-ft. airplane propeller that graced the front of the car. Small models of airplanes with revolving propellers, donated by the Grand Rapids Airport organization, were placed in front on the roof, and American flags at the rear.

Within the coach the bulletin board contains an artistic crayon drawing of the Colonel in flying regalia. Above the picture is the inscription: "This car is sponsored and dedicated to Colonel Charles A. Lindbergh by the Grand Rapids Flying Club."

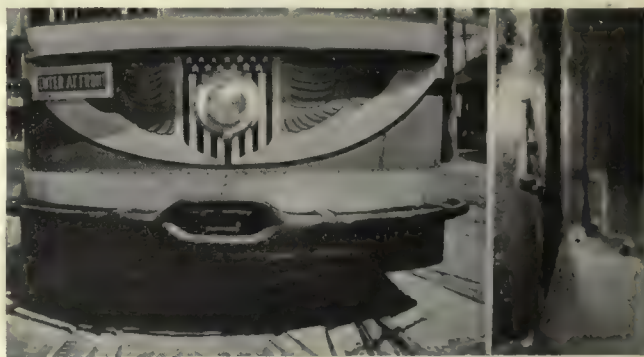
The car is painted in desert sand color, trimmed in red and black, with lettering in gold. The seats are an innovation, being round-top reed, upholstered with leather, with air cushions. Bulletins will be posted daily in the car by the Flying Club on matters pertaining to local and national aviation events. This and the continued operation of the Lindbergh car should tend to hold the kindly interest of air fans and their very active organization in the railway company.

* * * *

Side and End Car Bumpers in Grand Rapids

REALIZING that more automobiles collide with street cars than street cars with automobiles, the Grand Rapids Railroad has equipped its cars with bumpers as a protective measure. This has eliminated to a large extent the marring and scratching of car bodies, has prolonged the life of the paint job and at the same time has been worked out so that the bumpers have added to the attractiveness of the car by keeping the panels free from dents.

On the latest cars remodeled in the company shops a bumper has been placed the entire length of the car body, attached to the side panel at the sill line. This protects against sidewipes. It is made of steel tubing, the ends of the tubing being upset and swedged to a flat surface for bolting to the body. The bumpers are painted black and form a part of the attractive paint scheme.



The Grand Rapids company is experimenting with the tubular end and side bumpers shown above

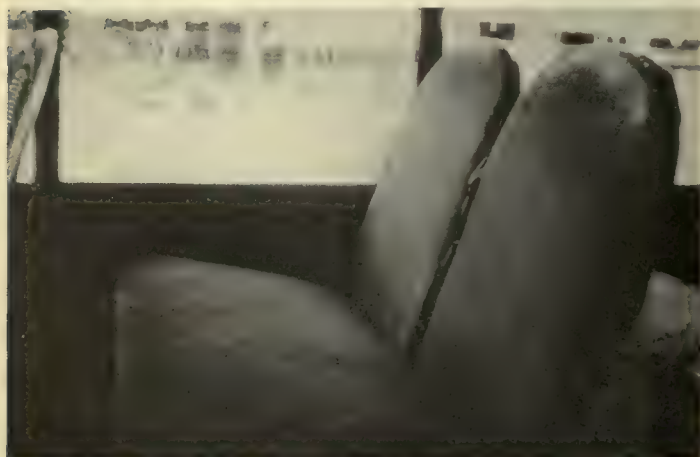
Front and rear bumpers are made of spring steel of a weight and size to conform with the weight and size of the car and are bent to shape to conform to the dash of the car and project from the dash approximately 6 in. so that the entire force of collision is taken up by the bumper. Horizontal bars of the bumpers are so arranged that there is no interference with the drawbar pocket and the drawbar slips in between two horizontal leaves of the bumper. Views of these bumpers are shown in the car views in the preceding pages. The company has also been experimenting with a tubular front bumper. It has been attached to the Colonel Lindbergh car as illustrated herewith. It has been found that the saving made in repairs due to collisions has more than offset the cost and installation of these bumpers.



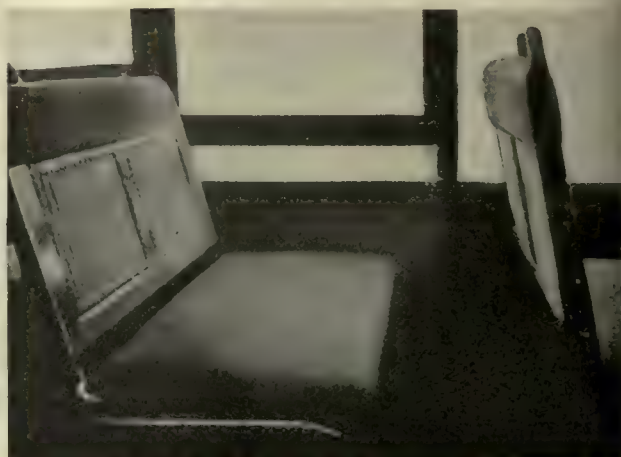
Deep-cushioned, rounded-back leather seat



Pullman type plush seat



Two-paneled upholstered seat with deep seat cushion and enameled reed back



Upholstered reversible seat with reed-paneled back made over from old type Birney seat



Deep-cushioned adjustable seat for operator, showing also the easy entrance and exit of car



Cushioned, upholstered reed adjustable seat for operator on remodeled Birney cars

Seats for the Passenger and Operator

IT IS said that the average man spends at least a third of his life in bed. Whether this is correct or not, every passenger on an electric railway, except during rush hours, spends practically all of his time in a seat. Hence, the comfort of the seat which he occupies is a large factor of the opinion formed by him of the service.

The Grand Rapids Railroad, which has been very successful in other ways in winning popular support, believes it would overlook an important business-getting feature if it did not pay especial attention to the character of the seats which it offers the riding public.

On its cars it has been experimenting with, and has developed, four different kinds of passenger seats for different types of cars. They are respectively the deep-cushioned, rounded-back leather seat, the Pullman type plush seat, the two-paneled upholstered seat with deep seat cushion and enameled reed back and the upholstered reversible seat with reed-paneled back made over from the old seat.

The company also believes that its car operators should be provided with comfortable seats, and for them it has developed two types—one is a deep-cushioned adjustable seat. The other, a cushioned, upholstered reed adjustable seat, is designed for the operator on a remodeled Birney car. All of these different types of seats are illustrated on the opposite page.

* * * *

Operating Costs Reduced at Grand Rapids

THE fact that the new rail coaches at Grand Rapids have been a major influence in the accomplishment there lends added interest to the company's expense accounts. The figures for the four principal accounts for the fiscal years ended May 31, 1927 and 1926, are given in Table I and show that there was a decrease in 1927 from 1926 in all four accounts, namely, way and structures, equipment, power and conducting transportation, although there was an increase in car-miles operated. The per cent reduction in way and structures expense was 10.72 per cent. While this can hardly be attributed

TABLE I—FOUR PRINCIPAL EXPENSE ACCOUNTS FOR YEAR ENDED MAY 31, GRAND RAPIDS RAILROAD

	1927	1926	Decrease
Way and structures.....	\$85,006	\$95,218	\$10,212
Equipment.....	119,210	176,896	57,686
Power.....	162,980	172,359	9,379
Conducting transportation.....	320,157	363,848	43,691
Total of four accounts.....	\$687,353	\$808,321	\$120,968
Car-miles operated.....	3,745,031	3,675,090	*69,941

*Increase.

wholly to the operation of the lighter cars, because it followed so quickly after their introduction, undoubtedly they produced less wear and tear on the tracks. The greater part of this reduction was undoubtedly caused by the extensive reconstruction of the track undertaken a short time previously, a reconstruction involving more than 20 per cent of the system.

The percentage reduction in equipment expense was 32.61 and was brought about very largely by the operation of the new coaches, which allowed the retirement of the old equipment that was costly to maintain. At the same time the pull-ins for the year fell off 52.11 per cent. Practically, the change allowed the company to reduce the working force in its car shops from 56 to 39 men, and later to shorten the working day from nine to eight hours without increased compensation. It will be noted that the saving in the equipment account, \$56,686, is larger than in any of the other primary accounts.

The reduction in power expense amounted to \$9,379, or a decrease of 5.86 per cent, and a corresponding reduction in consumption of 687,486 kw.-hr. This is the total amount of electrical energy purchased for all uses, including car propulsion, car heating, air compressors, lighting, shop power and track tools. In a sense it is more noteworthy than appears on its face, because the new electric coaches are electrically heated, while the cars which they replaced were heated with coal. The saving was also made in the face of the additional car-miles operated, as mentioned above. The kilowatt-hours used during 1926 were 3.36 per car-mile, whereas in 1927 they were 3.11 per car-mile.

The reduction in conducting transportation accounts was \$43,691, or 13.65 per cent. This reduction was largely accomplished through the inauguration of the new coaches, which are one-man operated, though of practically the same seating capacity as the old two-man cars replaced.

Table II shows the income statement for the past six years.

TABLE II—INCOME STATEMENT FOR SIX-YEAR PERIOD FOR YEAR ENDED MAY 31, GRAND RAPIDS RAILROAD

	1922	1923	1924	1925	1926	1927
Passenger earnings.....	\$1,798,898	\$1,825,185	\$1,742,796	\$1,682,199	\$1,710,633	\$1,710,126
Other earnings.....	46,061	53,596	63,031	50,017	39,643	47,220
Total gross earnings.....	\$1,844,960	\$1,878,782	\$1,805,827	\$1,732,217	\$1,750,277	\$1,757,347
Operating expenses.....	1,187,810	1,189,614	1,114,465	1,126,733	1,163,691	1,048,740
Gross income.....	\$657,149	\$689,167	\$691,362	\$605,483	\$586,585	\$708,606
Taxes.....	138,544	135,204	137,811	131,419	147,170	149,014
Gross income after taxes.....	\$518,605	\$553,962	\$553,550	\$474,064	\$439,415	\$559,592
Fixed Charges:						
Bond interest.....	\$224,000	\$222,166	\$232,608	\$271,357	\$265,474	\$258,135
Other interest.....	31,512	26,666	30,715	37,484	41,404	60,845
Depreciation.....	193,821	171,848	161,527	152,313	168,047	175,099
Amortisation of bond discount and expense.....	78,436	78,009	79,392	18,439	19,021	17,037
Bridge sinking fund.....	1,152	96				
Total fixed charges.....	\$528,922	\$498,787	\$509,244	\$479,595	\$493,946	\$511,117
Net available for dividends.....	*\$10,317	\$55,174	\$44,305	*\$5,530	*\$54,531	\$48,474
Revenue passengers carried.....	24,495,587	24,138,107	21,993,359	19,267,331	19,435,873	19,347,835
Car-miles operated.....	3,946,702	3,958,371	3,826,643	3,621,293	3,675,090	3,745,031

*Deficit.

Winning Popular Approval in Many Ways

The Grand Rapids Railway embraces every opportunity to improve its service and to make it more popular with its riding public



Loops for turning cars at the ends of routes are beautified by tasteful treatment

OTHER articles in this issue tell of the major points in the public service policy of the Grand Rapids Railroad, but no opportunity was overlooked by the company to improve its service and make it more popular. Brief accounts of some of these methods will be given.

PAINTING CARS TO ATTRACT PASSENGERS

With the introduction of the new electric rail coaches came the realization that pleasing color combinations on street cars offer an attraction that is conducive to increased good will and increased desire to ride. The idea, born in Grand Rapids, was used as an experiment to determine what the reaction of the public would be. Harmonious color combinations, public and parochial school pennants in their proper colors, also Boy Scout and Camp Fire Girls' insignias, truthfully reproduced, were introduced on the new coaches and gradually extended to many of the older cars on various lines.

STORES SELL STREET CAR CHECKS

Co-operating with store owners to accommodate their patrons, at the same time increasing the car riding revenues, the railway company has established stations for the sale of street car checks in the leading downtown department stores and in drug stores and business places in many parts of the city. This convenience to the public has not only been appreciated but has been mentioned in the advertisements of many stores because of its shopping and trade value.

Believing that a direct advertising contact with hotel guests would encourage street car riding as against taxi patronage, the railway management has followed such

a plan for several months. Through arrangement with the hotels, a trustworthy employee was detailed to slip under the door of each guest's room each night an attractive cardboard folder. It is of pocket size so that it may be carried for reference or mailed to friends soon to visit the city. The front page of the folder bore the cheery greeting "Good Morning!" and beneath it a half-tone picture of one of the new rail coaches. Beneath this a caption read: "Grand Rapids, the Furniture Capital of America, Welcomes You." The second page contained a map of Grand Rapids, showing the company's lines. The third page bore a message about the service given by the company and asking the guest to patronize it.

The back page carried a list of those places of interest, depots, factories, etc., such as a hotel guest would likely be interested in and can be reached by the street cars.

"WELCOME" CARDS FOR DELEGATES

Small-sized, attractively printed "welcome" cards are issued to delegates upon their arrival in the city to attend conventions, field days, touring parties, etc., where the number of persons would make it worth while.

These cards welcome the visitors to Grand Rapids and then add: "The Grand Rapids Railway takes pleasure in placing its service and its amusement park (if in the summer) at your disposal for your 1927 convention (field day, outing, etc.). We sincerely hope you (and your wife, families or friends) will have a most enjoyable visit (session, outing, meeting, etc.)."

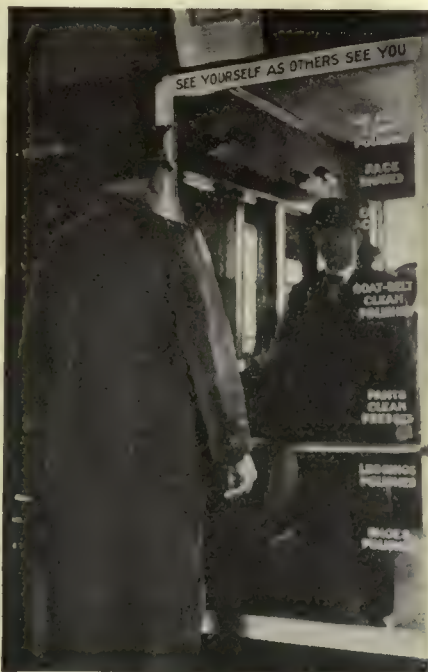
Letters are also sent to persons taking up residence for the first time in Grand Rapids. The newcomers may be in the midst of getting their new home settled, or may have it just established, when the mail brings them a

message from the street railway company welcoming them to the city, and in a sincere way inviting them to ride the street cars to work, to school, or shopping, etc., telling them the line nearest their home. Often it is the first letter received by them and it produces a favorable reaction. Usually the recipients do not understand how the company could learn of their arrival so soon. The key to the secret is that the moving van companies supply the information that makes the letter a success. Along the same lines a letter is also mailed to residents who change their street address, calling attention to the street car service nearest their new residence location.

PORTER SERVICE FOR STREET CARS

To maintain a high standard of car cleanliness, a special car porter has been stationed at a downtown central point on the system. He boards the cars and passes through them, picking up refuse left by passengers, wiping dust from seats and window sills, cleaning ashes off the floor in the smoking compartment, etc.

He does this while the car continues on its way and, when through, leaves the car and boards a returning car, which he cleans before arriving at the central point. In this manner practically all the cars receive special attention once or twice daily. This sort of secondary cleaning was formerly done at the ends of car lines, but the passengers did not know it. By having it done in the center of the city, where passengers see it, the company gets credit for the special effort which it is making. Furthermore, it employs the time of the porter more effectively, since practically all cars pass the point at which he is stationed.



Mirror provided at each carhouse to induce car operators to maintain a neat appearance

TRAINING EMPLOYEES IN SALESMANSHIP

That its service may meet the modern demand, the Grand Rapids Railroad has established a school for the education of its operators along the lines of safe, courteous, efficient service and salesmanship. The instructors are division superintendents. The curriculum includes good operation, safety, personal service, personal comforts, passenger friendliness, general public responsiveness.

The operators' views are taken and discussed. The operators are questioned regarding all phases of their work, their responsibilities and trying incidents that test their courtesy or the service, and an effort is made thoroughly to educate them to meet every situation that may

confront them. They are asked difficult questions, such as might come from passengers. If their answers are not favorable, proper instruction is given.

The objective sought is so to train these men that they will not be bound by a set of iron-clad rules, but rather will be fortified for any emergency, any situation, any problem, any question or any phase of the service where only good judgment and thoughtfulness could meet the situation.

After passing through this course, although the operator's viewpoint has changed in many cases, he has been unconsciously educated to a better understanding of his work, salesmanship and responsibility.

OTHER MEANS OF WINNING THE PUBLIC

At certain times the railway company has written letters calling attention to the safety and economical features of its service to owners of automobiles that were found on different days parked in or near the business districts. The letters invited the autoists to use the street car service, the invitations being worded in such a way that no resentment could be, or has been felt, by the autoist.

The company has always paid great attention to maintaining the attractiveness and cleanliness of its properties, especially those which are conspicuous, like loops. An accompanying view shows the manner in which loops are being beautified.

A new uniform of the "chauffeur" style was adopted in 1924 for the company's platform men. It is a two-piece olive drab suit with breeches and puttees and a business-like touch. In the car, chauffeur nameplates identify the operators and conductors. A full-length mirror in each carhouse helps the car operators to maintain a neat appearance.

A bulletin board at the front of each city car permits different civic associations to post notices of events of city-wide interest.

A young man in neat railway uniform is stationed at a central loading and transfer point to answer all general questions, give directions, and sell car tickets. His uniform has the words "Ask Me" embroidered on the sleeve.

The old longitudinal rattan car seats which were removed from the cars to make room for more modern types were presented to the Fire Department. They have made comfortable benches at the various fire stations.

Where the street width permits, permanent loading platforms have been erected. Where the streets have been too narrow for this, portable zones have been established by means of pipe and chain railings placed in sockets inserted in the pavements. After the evening rush-hour period these railings are removed.

A full uniform is presented to each operator who has a record for the year of no preventable accident during this period. Last year 85 awards of this kind were made.

Employees and their families receive free admission, by passes, on weekday afternoons to the theater at Ramona Park, which is operated by the company.

Suggestion boxes are maintained, at which any employee may drop a written suggestion or idea for the improvement of the service. Each month a special committee reviews these suggestions, and cash prizes are awarded for the best ideas that can be adopted.

Six or more employees, usually car operators, are invited to attend each of the monthly department head meetings. These invitations are divided equally among union and association men and are rotated among the employees generally.

Rebus Contest as a Business Getter

Grand Rapids Railroad offers prizes for successful solutions of puzzles based on the names of its cars



More than 10,000 persons came down town to view the exhibit of the Grand Rapids rebus contest the first day it was opened

DURING April of this year, while the car-riding patronage was showing a decrease, the Grand Rapids Railroad announced a street-car name rebus contest which ran from May 1 to May 30. The company has 76 cars with names. Of this number 27 were chosen and expressed in rebus sketches. A sheet with these sketches numbered and with the conditions of the contest was distributed in the cars. Any one in Grand Rapids except employees of the company was eligible to compete. Persons were asked to familiarize themselves with the names of the cars, then study each of the 27 sketches and decide the name represented by each sketch. The prizes offered were, first, \$25; second, \$15; third, \$10; fourth, \$5, and forty-five prizes of \$1 each. Three prominent citizens of Grand Rapids were named as judges.

Figures on passengers carried during the month indicated the contest stimulated riding besides popularizing the service. More than 60,000 rebus folders were taken from the cars and more than 2,000 answers received. One of the outstanding good-will and patronage features of the rebus contest was that every person who sent in an answer received a card of single admission to Ramona Park, good any time during the summer season. Recipients were notified of this "prize" and had to come to the company office to get it. This meant riding. Then, the single admission tickets probably brought increased patronage in both car riding to and from the park and in tickets for friends, because people seeking amusement do not go alone.

From the good-will building standpoint, the contest was perhaps even more important than as a revenue producer. The answers were submitted in all manner of forms, some very elaborate. But all through the 2,000 answers there came back to the company many of its advertising and public relations work expressions, reflections of its efforts to improve service and of the problems on which it had sought public understanding. The contest was a revelation in its proof that these efforts of the company had really made their impression.

Letters from Grand Rapids residents traveling in many states were received by mail, showing the folders were taken from the boxes before the residents departed from the city and were worked out while en route. Many patients in public and private hospitals and in homes wrote in thanking the company for the comfort and enjoyment they had found in working the rebus.

All answers, the rules required, had to be filed at the company's information office, or mailed. While one would suspect the preponderance of answers would be by mail, such was not the case, the office contact with the public being far beyond the company's expectations. Entire classes and rooms in different schools worked the rebus, sent a chairman to file it, and with it a letter of explanation.

After the prizes were awarded a central location was procured for prize distribution and there was an exhibition of the more novel and attractive answers. It was opened to the public to continue for four days. The first day more than 10,000 persons viewed the display, while the total attendance for the four days was more than 20,000, by clicker check. This again brought patronage to the cars and had its effect in building favorable reaction toward the railway. In general, the contest effected its purpose, made the people think and talk street cars for more than 30 days during a period unusually favorable for motoring.

* * * *

Turning a Park into an Asset

An annual feature is Kiddies' Day, when prizes are given to the children and all amusements are half price

ONCE it was thought that a park was a necessary adjunct to practically every electric railway company, but the cost of keeping it up and providing the attractions has done much to change this point of view.

The Grand Rapids Railroad is one company that looks upon its park as an asset rather than a liability. This resort, known as Ramona Park, is situated on the shores of Reed's Lake, near the city and at the end of a car line. A large sign at the entrance states, "This resort is maintained by the Grand Rapids Railroad for our citizens and their friends." An exceptional feature is that the company operates a regular theater there, offering the best Keith-Albee New York acts—the only high grade attraction in the city during the summer.

A policy of "free gate" to the park is maintained and reacts in public good will and increased revenue through more riders.

By keeping definite control of the concessions and entertainment the company maintains a high class park at all times and has won public approval because unescorted women and children are safe there at any time. This condition is made possible by a trained and courteous staff.

This activity on the part of the company is highly appreciated, so much so that the Grand Rapids Furniture Manufacturers' Association subsidizes this theater during the July furniture market season.

Another feature of Ramona Park operation is an annual event there during the summer known as Kiddies' Day. In August, 1926, the second annual Kiddies' Day celebration was held at Ramona. It taxed the facilities of the railway company to care for the unexpected throngs. More than 30,000 children enjoyed the gala

day arranged for their entertainment. Naturally many parents accompanied their children, with resultant benefit to street car revenues.

In first creating Kiddies' Day the railway management (though without thought of any profit) sought to have one day that the children could call all their own, when every child, rich or poor, of any race, creed or color, could have one day's outing at very small expense, for there are many in every city who do not ordinarily get these pleasures. Consequently, all amusement rides, theater admissions, etc., were made half price. The company, aided by concessionaires, gave away 100 valuable prizes, including a Ford, a pony, radio set, bicycle, dog, baseball suits and many other things the childish heart desires. In addition, 300,000 souvenirs furnished by department stores, banks and other establishments were distributed. Every child received a store of cherished things as tokens of the occasion.

Because of the public confidence, good will and patronage Ramona Park annually returns a profit to the company and certainly creates more riders.

* * * *

Short Notes on Big Events

A summary of some of the events not previously mentioned which helped the Grand Rapids Railroad to win the Coffin Prize this year

EVIDENCE of the rehabilitation of the Grand Rapids Railroad, financially and physically, does not rest on one event or a dozen, but on a great many—all of which cannot be recounted here for lack of space. Brief notes will be given of a few of the more important events not previously mentioned.

The litigation against the company for accidents has become almost negligible. Only three suits were begun against the company during the year ended May 31, 1927,

and all were of a minor character. One was dismissed by the plaintiff, the second was compromised out of court for less than \$50, and the third, involving about \$85, is still pending. Part of this satisfactory condition is due to the great care exercised in operation, part to the reputation the company has for fairness in adjusting claims, and part to its endeavor where liability exists to handle the matter outside the court.

Since the disastrous fire which destroyed its carhouse with many cars all carhouse employees are drilled in fire protection under the instruction of the City Fire Department.

SERVICE AT COST FAVORED BY CIVIC BODIES

In February, 1927, the Civic Round Table, composed of delegates from representative civic bodies, improvement associations, etc., passed a resolution to the effect that as the company was then on a service-at-cost basis it would be desirable to have it relieved from paying charges. This resolution was sent to the City Commission, which arranged to have an amendment to the City Charter to carry this resolution into effect submitted to the voters on March 7. Indorsements of the proposed amendment were passed by a very large number of trade and other civic organizations in Grand Rapids. Even a competitor in the transportation field, the principal local taxicab company, urged passage of the amendment. Unfortunately, the vote on March 7 was unfavorable. This may have been due to the fact that another amendment, providing for a 2-mill tax on all real property, was on the same ballot and the public thought they were dependent to some extent on each other or it may have been due partly to the inclement weather which kept many voters from the polls, or partly to the shortness of the campaign which did not give an opportunity for all voters thoroughly to understand the question. However, of the total vote of 8,565, the number cast in favor of the plan was 3,375, while only 4,190 were against the



An idea can be gained from this picture of the crowd of children assembled on Kiddies' Day at Ramona Park, Grand Rapids

measure. The other amendment was defeated by a vote of nearly two to one.

In November, 1926, the Grand Rapids Association of Commerce, later supported by the City Commission and other representative associations, nominated Mr. DeLamar, vice-president and general manager of the company, as the candidate from Grand Rapids for the Harmon Foundation gold medal and \$1,000 prize. This is an annual award to the individual, who, in the opinion of the judges, has been responsible during the year "for the creation, introduction or development of a distinctive contribution to the social, civic, or industrial welfare." In its letter to the foundation, making this nomination, the Association of Commerce emphasized the benefit to the city brought by the rehabilitation of the railway property. The nomination was indorsed by the two leading newspapers, many civic clubs and prominent citizens.

EQUIPMENT IMPROVEMENTS

In its equipment the company has made a number of improvements besides those already mentioned in this issue.

It has established a maintenance cost system by which small leaks in operating expenses are detected.

It has equipped two cars with roller bearings and has kept a careful record of energy consumption from meter readings and of their lubricating and inspection costs. The test has not been carried over a long enough period to quote definite results, though up to the time that the brief was submitted the lubricating and inspection costs for the roller bearings per month were much less than

for the plain bearings. Tests are also being conducted with one car equipped with band brakes.

Maps of the company's property and tracks have been prepared, drawn to a scale of 50 ft. to the inch. The track drawings show location of all poles, curb lines, tracks and paving, history of track, type of joints, etc. The plan is considered very much worth while.

RELATIONS WITH EMPLOYEES

The improvement in the company's equipment has been coincident with that of improvement in relations with its employees.

Suggestions as to betterments of the service are solicited from employees, and cash prizes are awarded for the best ideas adopted.

A company publication, the *Token*, is issued for circulation among the employees to encourage good public relations, increase courtesy to the public, teach tolerance, increase efficiency, and create a greater fellowship between departments. A leaflet, *Trolley Topics*, is issued monthly for circulation among the public through car boxes. Since June 1, 1926, every employee has had the benefit of free life insurance, under a group plan.

LARGE BOOK OF CLIPPINGS

A part of the evidence submitted by the Grand Rapids Railroad to the Charles A. Coffin Prize Committee consisted of a large book of many hundred pages in which clippings referring to the company had been pasted. The publications represented were of all kinds and from all parts of the country.

Caribbean Tramways Prosper

Narrow streets introduce serious problems, but there are compensating advantages, one of which is there is little automobile parking

ELECTRIC railway systems in the countries bordering on the Caribbean Sea are of smaller size than those in cities of equal population in the United States, but the traffic on their lines is comparatively heavy. In Havana, Cuba, the largest city in this area, local transportation is furnished by the Havana Electric Railway, Light & Power Company. The population of the city is slightly more than 400,000. The railway has more than 100 miles of standard gage track in the city and neighboring communities. A total of 590 cars are owned, of which 524 are required for regular operation. On account of the narrow streets and sharp curves, all the cars are of single-truck design. Double trolley wire is used at present, but plans are under consideration for changing to single wire. The fare is only 5 cents, but much of the riding is short-haul and the company is prosperous.

At Camaguey, a city of about 100,000 population, and at Santiago, which is somewhat smaller, the railways are under the same management as at Havana. The Camaguey Tramway operates 22 motor passenger cars on 10.5 miles of track, while the Santiago Electric Light & Traction Company operates 30 cars on 9 miles of track. The fare is 5 cents. Like that in Havana, the track is standard gage, but in contrast to the Cuban metropolis, the overhead system is single trolley wire.



Left-hand operation is a characteristic of electric railway service at Kingston, Jamaica

All cars on these three properties are of the two-man type.

Throughout Cuba the weather is so humid during the rainy season that particular attention must be paid to the wood work in car bodies. Duralumin screws have been found more satisfactory than brass. Outside body joints are first covered with canvas soaked in white lead and a finishing strip of wood is then screwed on over the



Narrow streets and double overhead trolley are characteristics of electric railway operation in Havana



Crooked and narrow streets are numerous at Camaguey and require complicated special trackwork at intersections

canvas. Double belt rails are used to protect the sides of the cars and the window posts from damage in the narrow streets. One belt rail is immediately below the windows, while the other is at the bottom of the side panel.

Kingston, Jamaica, is a city of about 65,000 population. Transportation is furnished by the Jamaica Public Service Company. This company operates 39 motor passenger cars on 26.6 miles of standard-gage track. As in England and some other British possessions, left-hand operation is the rule. This company also does a general lighting business.

In contrast to the other railways in this territory the Panama Electric Company's track in Panama City is 3 ft. 6 in. gage. Transportation is furnished to a population of 76,000 by 22 cars operated on 11.4 miles of track. This service is supplemented by two buses operated on 1.5 miles of route.



At Panama City the track gage is only 3 ft. 6 in.



At Camaguey the local electric railway uses single overhead trolley wire. Span wires are often attached to buildings in these narrow streets



Single-track cars are used in Havana on account of the narrow streets and sharp curves. Double belt rails protect the car body from damage by sidewipe

European Brake Practice

Surface cars use many types of power brakes, but the air brake is standard on rapid transit lines

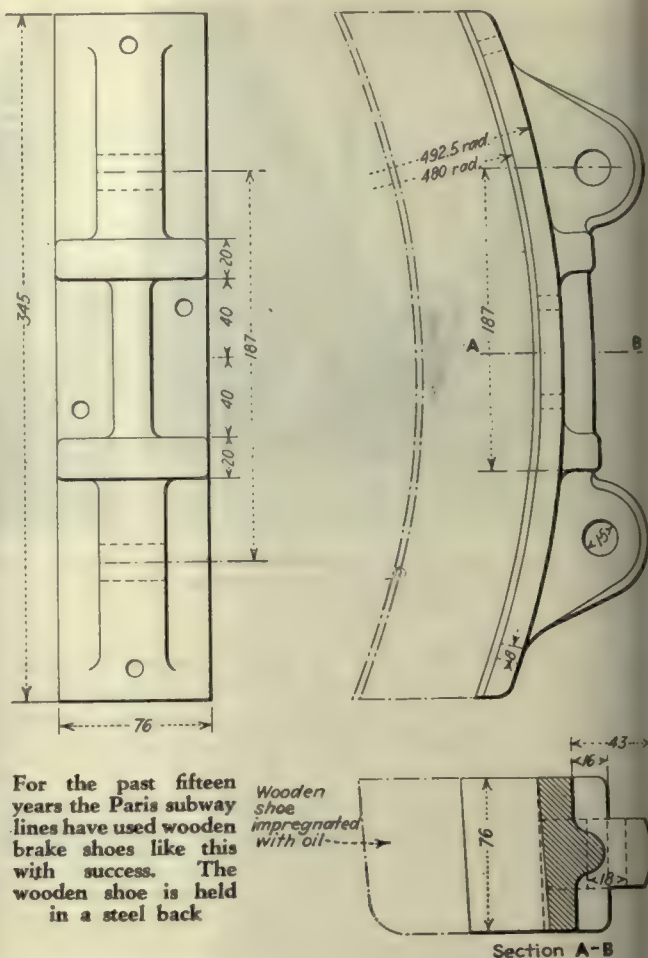
WHILE the air brake is practically the only power brake used in this country, this is by no means so in Europe. Other brakes whose use is very popular abroad are the various forms of electric brakes, such as the short-circuiting brake, solenoid brake and magnetic track brake. In Berlin electric brakes are so greatly favored that the air brake has been abandoned for surface car use. In the latest Berlin cars, equipped with spur gear motors, a band brake mounted on the armature shaft is employed. The trail cars use an axle disk brake, operated by hand or a solenoid. In the Cardan drive motor cars braking action is on the motor shaft.

Undoubtedly where the motors are used for braking cars, as with the short-circuiting brake and the magnetic track brake where current is taken from the motors, a greater load is put on them than where they are used for propulsion only, as in the United States. But this extra duty seems to have been considered when the capacity of the motors was chosen and burnouts do not appear to be more frequent abroad than here.

In London, where the magnetic track brake is used extensively, the track shoe is attached to the brake lever system, so that when the brakes are applied the track shoe stops the car by acting against the head of the rail and also by setting the wheel brake shoes. As the current to operate this brake is taken from the motors, action ceases, of course, when the car stops moving. Hence, at stops, the car is held at rest by the hand brake. Four magnetic track shoes are used on each double-truck car of the London County Council Tramways.

Air brakes are used on the rapid transit lines of Paris, London, Hamburg and Berlin, but sometimes wood brake-shoe blocks are used instead of the customary cast iron. These wooden blocks seem to give good results on lines which do not have to run in the open. In Paris, where such shoes are used very extensively, the wood employed is beechwood. After the shoe is cut from the wood it is put in a vacuum chamber, where all juice and sap are taken out. Then it is impregnated with oil under a pressure of from two to three atmospheres. Olive oil is used. Originally linseed oil was employed, but gave a bad smell when it became heated in train operation.

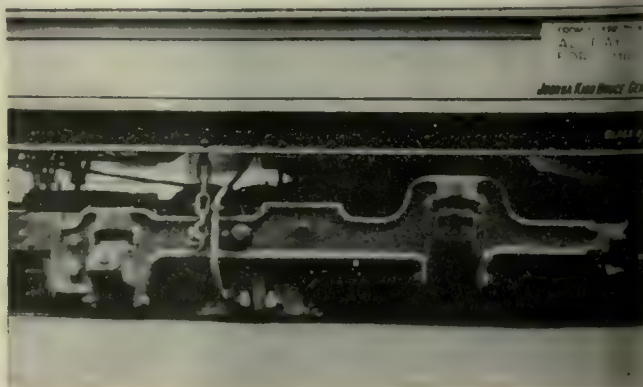
The wooden shoe is held in a cast steel back, as shown in the illustration, being attached to it by four screws



which pass through the steel back into the wood. All dimensions shown in the engraving are in millimeters.

The life of a wooden brake shoe under Paris conditions is about 30,000 km. (19,000 miles), whereas with cast iron the life is only about one-third this mileage. The wear is from abrasion of the material and not from burning. On all recent trucks on the Paris underground lines two brake shoes are used for each wheel.

In one subway line in London, which does not operate in the open, a composition called ferrodo is used for brake shoes instead of cast iron, but it has been found that where a wood or composition shoe is exposed to moisture, as in a line operating in the open, it becomes slippery. In consequence, iron brake shoes are used on all London subway lines except the one mentioned.



Magnetic brake shoes as employed on the Naples Municipal lines (left) and London County Council Tramways (right). In the Naples view the shoe is partly hidden by the side rod connecting the body posts on this single truck

Electrification Brings Profit to Illinois Central



Using a Modern Plant

The Illinois Central suburban service is distinctive for convenience, comfort, safety and speed. These qualities are possible because the plant is thoroughly modern.

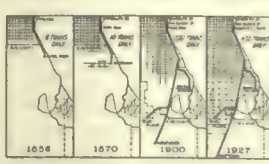
Two hundred sixty steel cars afford comfortable seats for 22,000 persons at a time. Clean waiting rooms are at all stations. One hundred eighteen miles of smooth and dustless tracks are used to expedite the different classes of service. From 800 miles of overhead wire is drawn electrical energy—clean, quiet and efficient—to operate the trains.

Upward of 100,000 commuters daily use this service. A continued increase in patronage will make possible the further development of its advantages.

Constructive criticism and suggestions are invited.

E. L. Downs
President, Illinois Central System.

ILLINOIS CENTRAL ELECTRIC



Growing With Chicago

For more than seventy years the Illinois Central suburban service has grown with Chicago.

In 1856 a wood-burning locomotive and a few wooden cars began making four round trips each week day between downtown Chicago and the outlying village of Hyde Park, six and one-half miles.



The Human Element

The superior service received by Illinois Central suburban patrons is a human as well as a mechanical product. More than 1,000 men and women devote their full time to the service, using with great skill the modern facilities with which they are provided.

Three hundred men operate the trains. These men are carefully selected and thoroughly trained. They are required to pass frequent examinations on physical fitness and on the rules of the service. They are a group of experienced veterans—the youngest man assigned to a regular run has fourteen years of Illinois Central service to his credit, the oldest has forty-two. These men are proud of their reputation for courtesy and are eager to assure the safety, comfort and convenience of patrons.

Perfection in every detail of the service is the goal of the entire suburban organization. Increased patronage will facilitate progress toward that goal.

Constructive criticism and suggestions are invited.

E. L. Downs
President, Illinois Central System.

ILLINOIS CENTRAL ELECTRIC



Electric Trains for Service

For six months we have been operating electric trains on our South Side suburban service in Chicago. We are proud of this important service, which has been hailed as a great contribution to the city's progress. Patrons have found the new service more comfortable and more convenient than the old steam service.

These results from the millions we have spent are too small to mention. We have not paid as much as we did in the past, but we have paid more for the service we have received. We are now ready to take the next step in our progress.

We want all Chicagoans to know about our service, and we want more of them who travel to and from the South Side to avail themselves of its advantages. The service is now perfect, but we intend to keep on improving it. In working out our plans, we shall be glad to have our patrons cooperate with us by giving us the benefit of their views.

Constructive criticism and suggestions are invited.

E. L. Downs
President, Illinois Central System.

ILLINOIS CENTRAL ELECTRIC

ELECTRIFICATION of the suburban service of the Illinois Central Railroad in the Chicago area is one year old on Aug. 6 this year. While officials of the company do not feel that all the benefits from this move can as yet be specified it is interesting to note the comments of President E. L. Downs, as given out in a recent interview with Oscar Hewitt of the Chicago Tribune. Mr. Downs said:

Despite a considerable increase in investment, the increase in patronage has combined with a decrease in operating expenses to produce an improved earning situation. The operating deficit, which was a feature of this suburban service prior to its electrification, is being slowly but surely reduced, and there is reason to believe that if the present favorable condition continues—particularly that part of it having to do with the important factor, increased patronage—the service will eventually become a paying proposition.

Present investment carried on the books chargeable to operation of this service totals \$23,500,000. Of this amount \$10,000,000 is represented by rolling equipment and \$13,500,000 by other facilities.

Among other things commented upon by Mr. Downs are factors that have brought about an increase in patronage under electrification are: Running time of suburban trains has been reduced on an average of 15 to 25 per cent as compared with the old steam schedules. The last steam time-table listed 406 trains serving the south side, compared to 450 trains listed on the time-table of the first electrification operation. On June 26 last this number had increased to 485 trains, and the present schedule of 542 trains is an increase of 33½ per cent.

Suburban service on the Illinois Central during the year 1926 was mostly operated by steam at a deficit of \$337,000. Under an exclusive electric operation the profit is estimated at \$400,000. The company's net operating income for the first six months of this year was \$241,000, which, as Mr. Hewitt comments, makes the estimate of \$400,000 for the year a conservative one.

Some of the reasons for increased patronage on the Illinois Central suburban electrified service by Chicago commuters

This estimate for 1927 shows a difference of \$737,000 in the net operating income between this year and last. During the first six months of 1927, excluding Sundays, the road handled daily 91,621 passengers, as compared with a daily average of 76,457 passengers for the first half of 1926, 77,074 for 1925, 77,533 in 1924, 73,393 in 1923, and 68,259 in 1922. There were 11,848,000 riders during the first half of last year, as

compared to 15,108,000 this year, and this increase is attributed to speed, the average being 58 m.p.h. for the trains. The abolition of dust, smoke and cinders and the uncomfortable jolts occasioned by steam operation played their part, as does cleanliness, in making the new service popular.

According to President Downs, "the new schedule provides an express train in each direction every ten minutes throughout the day between Hyde Park and 67th Street inclusive, in addition to the special trains serving some of these stations. It gives an express train in each direction every twenty minutes throughout the day for stations on the South Chicago line, and between 72d Street and Kensington—115th Street and the main line. The new schedule also provides nineteen additional local trains daily between Randolph Street and Hyde Park."

As pointed out by Mr. Hewitt in his report, while no Illinois Central official will consent to be quoted, several of them both hope and expect that the electrified suburban service will carry 30,000,000 riders this year—an increase of more than 5,000,000 over last year.

On the anniversary of the electrification, the south side staged a celebration in Washington Park Race-track, to which there were more than 20,000 invitations sent out. Meanwhile, as shown in the accompanying illustrations, the road is selling its electrified service to commuters through attractive newspaper advertising.

Rehabilitation Program of Norfolk Property

AS ANNOUNCED in a recent issue of this paper, the Norfolk Division of the Virginia Electric & Power Company is rehabilitating sixteen of its double-truck cars from two-man operation to one-man operation, at an approximate cost of \$100,000. The work is being done at the company's shops under the direct supervision of T. W. Madison, master mechanic.

General details of the cars before converting are as follows:

Length.....	45 ft. 10 in.
Width.....	8 ft. 6½ in.
Height, rail to trolley stand.....	11 ft. 3½ in.
Inside length.....	31 ft. 10½ in.
Inside height.....	8 ft. 3½ in.
Inside width.....	8 ft. 2 in.
Seating arrangement.....	Sixteen crosswise seats and four 5-ft. longitudinal seats, with a combined seating capacity of 54. Seats of wood framing with rattan centers
Type of body.....	Round top with U-shaped "T" iron posts. Entire body of steel with exception of floors and inside finish
Trucks.....	Brill 27G-1
Brake cylinders.....	Westinghouse 8-in.
Air compressor.....	General Electric CP-27
Motors.....	Four Westinghouse 514-C, gear ratio, 14:64
Controllers.....	K-35 G-2
Total weight of car.....	36,000 lb.

In order to reconstruct these cars for one-man operation, all modern safety car appliances are being installed including a full set of pneumatic door controls, both front and rear, with a rear door treadle attachment. This necessitates the removal of the entire vestibule and platform, the only remaining part of the entire front being the hood. In rebuilding the old platforms, two side platform knees are being made from 9-in. channel iron bent into the proper shape. The two center platform knees are fashioned from 2½-in. x 9-in. white oak, the crown sill of 2½-in. white oak, bumper of 6-in. channels, corner and center vestibule posts of white oak, dasher of 14-gage steel, 36 in. high, and inside of vestibule below windows of 18-gage steel.

The right-hand doors are double folding with individual steps and control. The left-hand doors are folding, with treadle attachment, all doors opening outward. One special feature in the construction of the door-operating mechanism is that all piping is entirely concealed by the inside finish of the vestibule, thus making the job neat appearing.

The interior trim is of natural wood with a cherry red finish, while the exterior has a color scheme of red, white and blue. The lower part of the car bodies is in red enamel, the body above the sills in white and the roof



1. Virginia Electric & Power Company's car before remodeling. These cars were purchased in 1917. Sixteen of the units are passing through the Norfolk shops.

2 and 3. Views showing the car interior before and after the changes. Individual type deep-cushioned seats replace the old bench type seats of the old car.

4. One of the rehabilitated cars of the Norfolk Division, Virginia Electric & Power Company. Compare its striking appearance with that of the old car

colley catchers, headlights and other trimmings in blue. Iron parts around the bottom are painted black, the trucks a dark red and striping and lettering are in imitation gold.

Each car has twenty double seats of the individual fashioned type, as shown in one of the illustrations, and longitudinal side seat at each end of the car body. The seats are of spring construction, 8 in. thick and covered with genuine hand-buffed leather. Cushions for the backs are 4 in. thick. Each vestibule is provided with a folding seat and an upholstered seat with back for the operator.

Other details of the car are Hunter illuminated signs, two rotary foot gongs, porcelain sanitary hand straps, interior window wipers and hinged side window rods. Sixteen single-coil, cylinder type heaters are installed under the seats and two of the double-coil type in each vestibule. The operating equipment includes Westinghouse air brakes with 10-in. cylinders, Peacock staffless and brakes, Westinghouse type 801-E-4 line switch equipment and K-75 controllers, chair level type, with A-8 handle switches.

The Readers' Forum

Where Are the Many Track Maintenance Kinks?

PUBLIC SERVICE PRODUCTION COMPANY

NEWARK, N. J., Sept. 22, 1927.

To the Editor:

As a member of the committee of judges which is passing upon the various entries in your Maintenance contest, I have been very much surprised at the relatively small number of items that have been entered by representatives of the way and line departments. Those that have been submitted possessed considerable merit, but it cannot be true that there are not many more special devices, developed by track and line men for everyday use to meet some particular need on their own property, which are simplifying some maintenance operation and reducing track maintenance costs. It is in the hope of attracting more attention from these branches of the service that this letter is written.

It is certain that throughout the country there are many special welding machines, contact devices for taking power from the trolley wire, special methods of rounding to the rail, spike pulling apparatus, rail straightening equipment, track drills, grinding tools, tar kettles, track gages and many other pieces of equipment so numerous to mention which have been developed to meet a local condition but which would have an application elsewhere and which have been playing their small part in putting the electric railway industry back on its feet.

Perhaps this apparent indifference is due in large measure to a feeling on the part of the track men that they cannot adequately express their ideas in writing or it may be due to their inability to secure the necessary photograph, snapshot or sketch of their pet device. Possibly the track men as a class are too modest, or it may be that they have not been fully advised of the contest and its terms. Then, again, it is possible that they have not considered that their device possessed sufficient merit to justify entering it in the contest.

But whatever the reason, the fact remains that entries

from the equipment men were greatly in the majority and some mighty fine ideas have been submitted, so much so, in fact, that it was frequently quite difficult for the judges to pick out the winner.

There is no question but that in most cases the trouble could be corrected by a little co-operation between the engineer and the track foreman. It is the idea itself and its application which counts the most, the matter of penmanship and smoothness of expression of the idea being secondary to a well-illustrated device.

It is to be hoped that as the contest enters its second stage it will draw out an increasing number of entries from both the way and line departments.

HOWARD H. GEORGE,
Member Judges' Committee.

Long Life from Brake Hangers with Hardened Bushings

DALLAS RAILWAY & TERMINAL COMPANY

DALLAS, TEX., Sept. 20, 1927.

To the Editor:

Additional information is given in regard to brake hangers which were rebuilt to eliminate rattle, as described in the July 23 issue of *ELECTRIC RAILWAY JOURNAL*, page 156. The ball and socket hangers referred to are giving us an approximate mileage of 135,000. When we began first to use the straight hanger, as described, there was no such thing on the market as hardened steel bushings for these hangers. At the present time, however, we have 30 sets of Brill 177-E-1 trucks, and all the hangers for these have steel hardened bushings. These hangers are showing very little wear at the present time, after about one year's service.

J. L. BROWN,
Master Mechanic.

In Defence of the Double-Deck Car

WALLINGTON, SURREY, ENGLAND, Sept. 5, 1927.

To the Editor:

I have read with interest the editorial comments on my article on double-deck cars in your issue of July 30.

In Great Britain the upper deck attracts passengers by the freedom for smoking permitted and the provision of cross-seats. While this might not be the case in America, the provision of seats for the majority of passengers during rush hours should be sufficiently attractive. Even if the increased capacity and the economy of operation and street space are not considered of appreciable value, it cannot be disputed that the double-decker permits a higher standard of service. The big single-deck car can handle peak loads, but only with a high percentage of standing. Is not this improved service worth striving for?

I do not understand why a double-deck car with ordinary load is necessarily a two-man vehicle or why a headroom of, say, 6 ft. 3 in. should incommode standees.

Stair accidents over here seem to be extremely rare, yet the cars on our more progressive systems are smoothly operated. And I imagine that the acceleration and braking in London, due to 130-hp. equipment and track brakes, is as severe as any in America.

Finally, I suggest that if the stairs are placed away from the door, so that passengers may ascend or descend them while the car is in motion, there need be no difference whatever in the loading characteristics of double and single-deck cars.

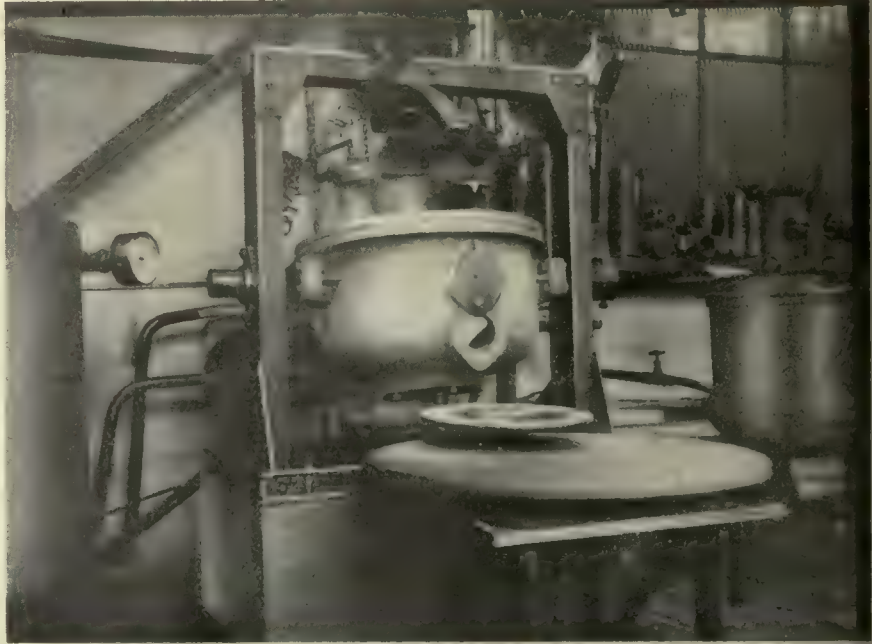
HENRY WATSON.

Maintenance Methods *and* Devices

Testing Pinions by Electro-Magnetic Method

MOTOR pinions are tested by an electro-magnetic method for minute cracks which would escape examination by the visual process in the shops of the London County Council Tramways, London, England. The method is similar to that used by the same system for testing axles, which was published in the issue of Aug. 27. The pinion is clamped in a frame, as shown at the right in the first illustration, so that it forms one leg of a magnetic circuit, the leg at the left being wound with wire. When direct current is passed through the coil the pinion is magnetized. It is then removed and retains sufficient residual magnetism so that when it is dipped into a box containing iron filings wet with kerosene, in a manner similar to that used for axles as described in connection with the testing of axles in the issue of Aug. 27, previously mentioned, the presence of any hair cracks is indicated by a line of filings which remain on the pinion at such points.

After the magnetic test the pinion is given a mechanical test in the frame shown in the second illustration. Two arbors are placed at the same distance as the gear and pinion centers in the motor. A standard gear is then placed on the gear arbor and the



Temperature-gage regulated furnace for bearing metal, Dortmund

pinion to be tested is placed on the other arbor. When the pinion is turned by a crank any eccentricity or other defect in the form of the pinion can readily be seen. For the testing of gears the same device is employed, except that a standard pinion is used.

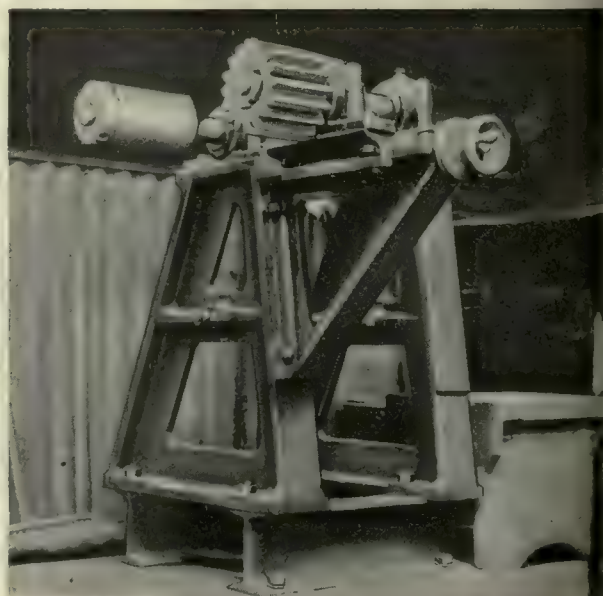
The distance between the centers of the arbors is adjustable to correspond with the gear centers of the various types of motors used on the property.

Bearing Metal Furnace

BEARING metal is best when melted and cast at just the right temperature. To insure this, the Dortmund Street Railway, Dortmund, Germany, has installed a furnace with an automatic temperature regulator. It is of the tilting type and the heat is supplied by gas. The furnace was built by the Aktiengesellschaft für Feurungstechnik, Berlin.



The magnetic process is used to test pinions for cracks in the shops of the London County Council Tramways

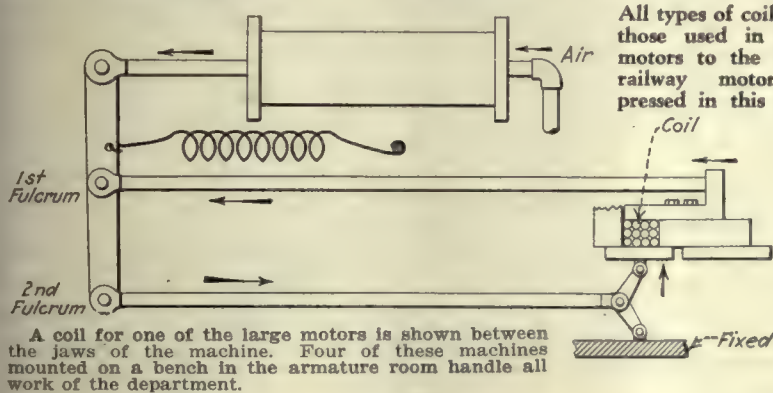


In this frame the mechanical perfection of a pinion and gear are tested

Armature Coils Clamped by Air



Air-operated armature coil press gives both upward and sideward pressure to the coil. The use of the toggle link to give the upward pressure and the employment of the principle of changing fulcrums on the rear vertical lever accomplish these results.



COILS for all types of armatures, from those used in compressor motors to the largest size railway motors, are pressed in an air-operated device which was developed at and is now used in the South Park shop of the Los Angeles Railway. This clamp applies pressure to the newly wound coil in two directions, forming the sides and other portions of the coil to perfect shape.

The lower jaw of the clamp is first raised up against the coil. Then the outer portion of the clamp moves sideways toward the coil, thus compressing it in that direction. One air cylinder mounted on the top of the apparatus produces the double action by the use of a toggle lever or combined with the principle of changing fulcrums. The accompanying illustrations show how this is done.

The movement of the air cylinder piston to the rear first actuates the

toggle links directly under the jaws and dies of the machine. After the toggle links have straightened out the fulcrum of the vertical lever at the rear shifts from its center to its extreme lower end. Continued movement of the air cylinder piston actuates the center lever, carrying the



Material used for structure of half section of bridge

outside jaw or die of the machine with it.

Different size dies have been made for use with various sizes and shapes of coils. A battery of four of these machines is located in the armature room. They are capable of handling all of the work of coil pressing required by the department. The machine frame is made up of $2 \times \frac{1}{2}$ -in. flat steel with the head, dies and clamps of cast steel. An air cylinder built up of steel tubing has a stroke of approximately 8 in. and a bore of 4 in. The operation of the device is controlled by a treadle, which when depressed opens the air valve on the cylinder.

Old Rails and Angle Bars Used for Small Bridges

By A. H. SMITH

Railway Superintendent Interstate Power Company, Dubuque, Iowa

IN RENEWING small railway bridges and crossing culverts on a toll road to one of its parks, the Interstate Power Company, Dubuque, Iowa, makes use of scrap rails and obsolete angle bars. The accompanying illustration shows the material arranged for a half section of one bridge.

In the construction a wooden form is spaced 1 ft. on each side of the skeleton bridge. After assembly the entire surface is filled in with concrete, on which the railway ties are laid. This furnishes a very permanent and substantial bridge over ordinary culverts.

This method of construction permits the use of the bridge almost immediately after it is finished as the rails are tied together with cross bars. With the usual type of reinforced concrete construction some time must be allowed for the concrete to set. With the construction used, however, the concrete is simply for spacing and holding the material together.

Coil Winding in One Process

WIRE armature coils are wound and shaped all in one process by a machine installed in the shops of the London County Council Tramways, London, England. It was built by the Midland Dynamo Company of Leicester and has an output of about 100 coils a day. It is known as the Quickway coil winding machine.

The armature coils are first wound as plain loops, after which the two arms shown in the illustration move outward, spreading the sides of the coils apart and giving the desired form to the ends. Obviously the arm movement required differs according to the type of motor for which the coil is intended, but the machine can be set to make any one of a number of various types of coils.

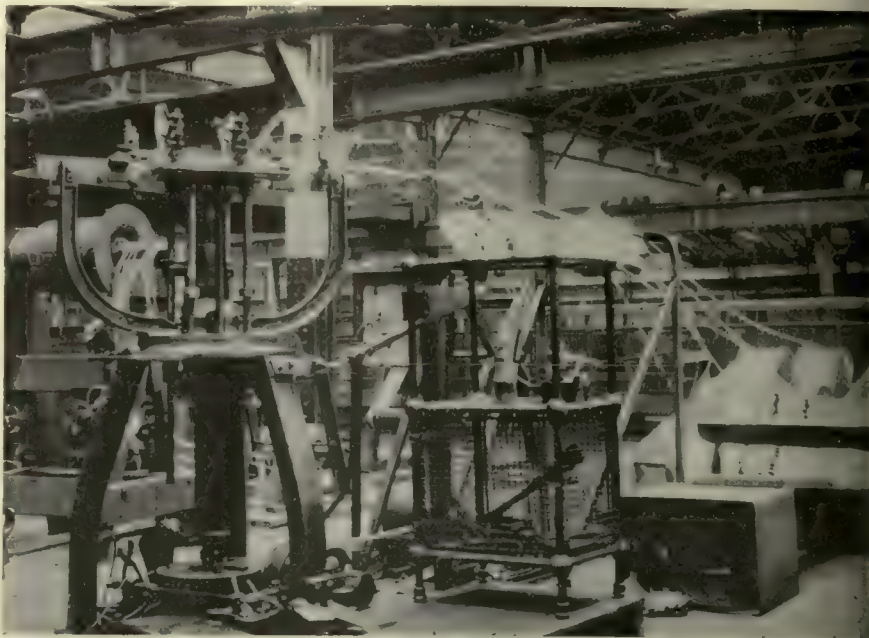
Incidentally, it might be said that where there are several separate wires in each coil it is the practice in these shops to use different colored insulation for each circuit. Thus if there are three circuits in each coil the insulation of the respective wires will be red, white and blue. This makes it very easy for the man who connects the leads into the armature to get the wires in their proper order because he simply has to put the wires into the commutator bars in the same regular rotation of red, white and blue.

Cleaning Car Side Panels in the Hamburg Shops

STEEL cars are used by the Hamburg Elevated Railway of Hamburg, Germany, and considerable attention is given to the outside appearance. The cars are attractively painted in a light color. As an experiment, two cars have been equipped with vitrified enameled plates for the side and end panels to eliminate the cost of painting. These cars have been in use for about two years, with no trouble from flaking or chipping of the enamel. All of the other 333 rapid transit cars of the company are painted.

In spite of this care in painting, the side panels of the cars rust out in from ten to fifteen years, because of the moist climate in Hamburg, and they have to be renewed. This work is done in the shops of the railway company.

To clean the new plates from rust before they are attached to the framework they are run through the sand-blasting machine shown in the accompanying illustration. The plates



This coil winder turns out 100 complete coils in a day

travel over the rollers shown in the foreground through a slot into the back of the dark colored vertical chamber. The sand is then sprayed on the plate from two nozzles which are moved up and down so as to cover the entire side of the plate as it passes through the chamber. The sand later is automatically collected for reuse.

This sand-blasting machine is used also for similar cleaning of the side plates to be attached to surface cars, of which the company has 1,900, and of buses, of which it has about 80. Hence there is enough work for it to do, as all buses have steel bodies, and it is kept busy.

Pneumatic Hoists Change Trucks Under Car Bodies Rapidly

HYDRAULIC jacks are used by the London County Council Tramways, London, England, for changing car bodies in its shops, and the work is done so rapidly that only about half a minute is required to raise the car body. The car is brought in on a transfer table and when it reaches the lifting point there is a hydraulic jack under each corner post. There are several sets of these jacks on the line of the transfer table. They are connected by hose with the central source of supply, so they can



Inclosed sand blast for cleaning car side plates in the Hamburg Elevated shops



Hydraulic jacks on each side of the transfer table lift cars very rapidly for truck exchange in London

moved if necessary to provide for their proper adjustment under the car. Movement of a handle then rapidly raises the car body in the short time mentioned.

While the old trucks are taken out

and the new ones are being substituted there is opportunity for the workmen to examine the underside of the car. If the car body needs repair, dummy trucks are placed under it and it is then taken to the body shop.

New Equipment Available

Trapezoidal Tie Plate Without Long Heel

TO PROVIDE the necessary eccentricity of a tie plate for equalizing its bearing on the tie in an expensive manner, the Track Specialties Company, New York, N. Y., has just developed a new plate. It is wider on the outside than on the inside and a short heel is used instead of a long one. Maintenance of way men have long recognized the neces-

sary, as ordinarily used, this is accomplished by offsetting the plate with respect to the center line of the rail so that it has a greater extension outside than inside the rail.

The new plate of the Track Specialties Company is symmetrical in the section about the center line of the plate, but its trapezoidal plan provides a wide edge along the outside of the rail and a shorter one along the inside of the rail base. This makes it possible to locate the center of gravity of the plate-bearing area at a sufficient distance outside the center of the rail to coincide with the resultant of the forces acting on it without extending it out as far as would otherwise be necessary. The short heel prevents the plate from curling so that the thickness can be reduced.

Plates of this design will be rolled from steel to meet the specifications of railways and can be had in any non-patented type of base, although the present plan is to roll these plates with flat bottoms. The plates are punched for either three or four holes, as desired, but must have shoulders on each side, as economy with beveled shearing demands that the plate be symmetrical in section.

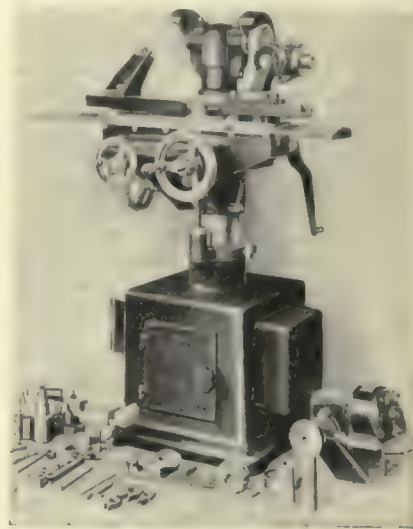
Universal Cutter and Tool Grinder

PROVISION for a machine of medium capacity for grinding tools has been made in a new design just brought out by Gallmeyer & Livingston, Grand Rapids, Mich. Convenience of operation has received prime consideration. The ma-

	Inches
Size of table	5 x 26
Longitudinal travel	16
Transverse movement	8
Vertical movement	6 1/2
Maximum distance center line of spindle to table	9 1/2
Maximum swing	9 1/2 x 20
Capacity for face milling cutters, diameter	12

chine is designed so that the knee, saddle, sub-table and table swing around the column, while the table in turn swivels on the sub-table. Transverse, vertical and longitudinal movement can be obtained from a position directly in front of the machine or from the rear of the machine. Both handwheel and lever movements are provided for the longitudinal movement.

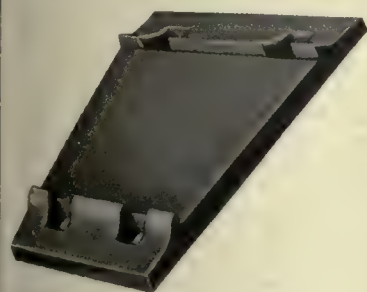
The vertical and cross-movements are provided by an Acme thread running in a bronze nut. Both are fitted with graduated dials reading in thousandths of an inch. The longitudinal movement is provided by means of an accurately cut steel rack with which meshes an equally carefully cut steel pinion with ground



Cutter and tool grinder

shank or stem. This insures free movement devoid of backlash.

The new machine is of very rigid construction and is equipped with hammered crucible steel spindles, ground accurately and running in well-oiled bronze bearings. Convenient means is provided for adjusting both for radial wear and end play. The machine can be furnished either belt driven or with self-contained motor drive. When furnished with motor drive, the equipment includes a 1-hp. motor placed in the base of the machine for driving the main spindle and a 1/2-hp. motor built into the headstock for revolving the work. The accompanying dimensions show size and capacity.



New type of tie plate

ty of having a plate designed in such a manner that the center of gravity of the bearing area will lie outside the vertical plane through the web of the rail to coincide with the resultant of the vertical and lateral forces acting on the rail. The resultant is inclined in an outward direction and intersects the base of the rail outside the center line of the base.

The solution of this problem in the design of the tie plate has been to proportion it in such a manner that the center of gravity of the bearing area coincides with the point at which the resultant of the forces acting on the rail intersects the base of the plate. With a plate of rec-

Association Activities

National Safety Council Meeting

Intense interest evoked by a series of well-prepared papers on various phases of safety in the railway field.

A. W. Koehler elected chairman

DRAWN by a program of the most transcendent interest yet conducted, more than 250 individual representatives from the electric railways met in Chicago last week together with nearly 5,000 other representatives of American industry to participate in the sixteenth annual congress of the National Safety Council. The sessions of the electric railway men as well as the parallel meetings of 35 other groups, which were held in the Stevens Hotel from Sept. 26 to Sept. 30, were the largest and the most eminently successful of any yet sponsored by the council.

The electric railway section meetings were attended by representatives of all the principal properties of the country and many smaller ones, the delegations in many instances being composed of every class of employee, from operating executives to platform men and shop workers. Significant of the increasing co-operation between employees and managements in matters of safety was the presence of E. D. McMorro, officially appointed delegate of the Amalgamated Association of Street and Electric Railway Employees of America. The section meetings this year were the best attended of any in the history of the organization, there being an average turnout on the three days of the congress of 235 delegates.

Summarizing the discussions and conclusions of the last annual meeting of the section, Truman Curtiss, superintendent of transportation Chicago, Aurora & Elgin Railroad, asserted in opening the first day's program that an accident prevention program could be carried out successfully only when initiated and followed through by heads of departments. From this point the speaker turned to the more technical questions of stop signals, safety zones and other matters related to traffic regulation, his remarks being principally intended to introduce new points and to stimulate discussion of them. The consensus of all expressions given on the subject of stop signal locations was that they should be built on concrete blocks in the center of the road, although several delegates insisted that this system leads to frequent automobile crashes.

SELECTION OF NEW MEN IMPORTANT

In connection with his paper on the "Selecting and Training of New Men and Their Relation to Safety," Clinton D. Smith, superintendent of personnel Cleveland Railway, declared that his company required a minimum of from

ten days to two weeks instruction for all trainmen before they were permitted to take out a car. "The careful selection of employees is the most important factor in accident prevention and this should include not only physical examinations but mental and psychological tests as well," he said.

Mr. Smith strongly emphasized, however, that every employment manager must to a very considerable extent rely on his own observation and judgment in selecting an employee. Careful records, he added, should always be kept of every applicant on the theory that although no opening may exist at the time, it is conceivable that the man might some day make a valuable employee.

In the discussion which followed Mr. Smith's address, it was revealed that many street railway companies have employee training courses lasting three and four weeks or even longer. On the question of physical and psychological examinations, A. W. Koehler, Milwaukee Electric Railway & Light Company, interposed that his organization was a firm believer in both types and had consistently employed them for years. Others declared that no examinations of any kind were given to trainmen on their properties, while a few delegates indicated that the tests were confined to color blindness or other single factors.

Dr. Hart E. Fisher, medical director Chicago Rapid Transit Company, told the meeting of his own interesting experiences in obtaining the confidence of employees and their families in matters of health. "You cannot go at things in a mechanical way when you are dealing with human nature," was his parting remark.

In a paper entitled "Courtesy and Its Relation to Accident Prevention," L. M. Brown, vice-president Interstate Public Service Company, implanted the thought that "the courteous employee is usually the cautious and the efficient employee." Courtesy, he added, is a principle of modern transportation that should be regarded as of equal importance with convenient and reliable service and safe operation.

Addressing the electric railway delegates on the second day of the convention, H. H. Adams, superintendent of shops and equipment Chicago Surface Lines, referred to the light-weight, low-hung type of car, with pneumatically-controlled doors, treadles, folding steps, lightning arresters, line breakers, dead man's handle, illuminated signs and

other features which have resulted in greater safety to passengers and trainmen. All of these devices are helpful, he declared, but should be utilized only after close study of operating conditions and practices as they exist on the individual properties.

Among the recommendations made by Mr. Adams in this connection was that brakes should be so proportioned to car weights that quick application will be insured. Good practice dictates a braking ratio of 9 to 1 with quick service valves, he declared. A clear-ringing, dependable gong is another essential to safe operation and the maintaining of schedules in congested city streets. The speaker also pointed out the necessity of regular 24-hour inspections of all vital parts of the car, such as brakes, fenders, flanges, etc., not only for improved safety but for the better maintaining of schedules. "Some equipment failures may be factors in accidents and excessive wear of parts should not be tolerated. Eternal vigilance is the price of safe operation," he concluded.

GONGS STILL HAVE A PLACE

Discussion of Mr. Adams' paper centered principally around the most suitable type and location of gong and the various methods used in inspecting car equipment. E. K. Eastham, safety director of the United Railways of St. Louis, commented that many claims had been filed against his company on the grounds that the folding step had failed to operate properly and on this account 20 per cent of the cars in St. Louis had been equipped with "well-steps." Replying to a remark that gongs are obsolete, Mr. Adams said the real need was for better gongs, not for some substitute device, because the public has become accustomed to their sharp insistence. The question of how rapidly the gong should be struck, however, is one that is well worth study, he avowed. To the question of what time limit he thought should be placed on the application of the controller handle, Mr. Adams replied that the Chicago Surface Lines endeavors to keep its equipment maintained so that the motorman may feed up his controller rapidly and brake at the rate of 4 m.p.h. per second in order to maintain the highest possible schedule speed, which at the present time, he added, averages about 11.2 m.p.h. Mr. Eastham's comment on this statement was that if such a practice were permitted in St. Louis the company would have 25 claims a day from passengers thrown out of their seats.

A delegate from the United Railways & Electric Company of Baltimore contributed the information that on articulated cars in his city and in Boston trolley bases are placed over the front

truck, the trolley rope being led down through a slot in the roof to a retriever located inside the car at the center. This arrangement was reported to be a great time saver and a positive factor in the conductor's safety.

In order to simplify the daily inspection of equipment on the Chicago Surface Lines, Mr. Adams explained, in closing the discussion, that all defects can be quickly spotted and handled from the reports turned in by the motormen at the end of the day's runs.

CHARACTER AND ENTHUSIASM ESSENTIAL

"Earnestness, enthusiasm, strength of character and knowledge of his property are the essential requirements of a successful safety director," declared A. W. Koehler, superintendent of accident prevention Milwaukee Electric Railway & Light Company, "because it is almost impossible for the superintendent to get in touch with every man of his organization, and the safety director must be qualified to substitute for him. Since the electric railway business does not lend itself particularly well to the use of mechanical safeguards, safety work in this industry is dependent very largely on intensive education, bulletins, posters, and above all, personal contacts with every individual of the railway organization."

The most important functions of the railway safety committee, Mr. Koehler said, may be classified as follows:

1. To inspire confidence and respect for the company's safety activities.
2. Dissemination of information about accidents and causes of accidents.
3. Stimulation of interest in safety suggestions and in planting in the employee's mind that the management is anxious to receive them.
4. Investigation of conditions and practices leading to every accident and the making of recommendations as to the kind and degree of discipline to be meted out.
5. If the men serving on safety committees can be made to feel individual responsibility in such work, they are almost certain to take keener interest and greater pride in other functions of their jobs.

While he suggested a number of methods that have been successfully employed in selecting safety committee personnel, Mr. Koehler was of the opinion that such appointment should always be governed by local conditions. Regardless of whether the members are elected by the employees from their own numbers or whether they are appointed directly by the superintendent, it is essential that unlimited inspiration be given to the members of the committee. Only such men as are natural leaders should be placed on the safety committees and too much system should not be allowed to harass them.

"Because of the natural seriousness of the work they are engaged in, the most satisfactory results can be obtained when humor is injected into the meetings," he said. "If any real response is to be won from the employees, some kind of answer should always be given to their safety suggestions, for it is only according to the degree of co-op-

COMING MEETINGS OF *Electric Railway and Allied Associations*

Oct. 18-21—National Association of Railroad and Utilities Commissioners, thirty-ninth annual meeting, Baker Hotel, Dallas, Tex.

Oct. 26-27—Public Utilities Association of West Virginia, annual convention, Parkersburg, W. Va.

Oct. 26-27—Society Automotive Engineers, Transportation Section meeting, Hotel Sherman, Chicago, Ill.

Nov. 4—American Institute Electrical Engineers, New York Section, Engineering Societies Building, New York City.

Nov. 2-3—Iowa Electric Railway Association, operating and maintenance sections, annual convention, Blackhawk Hotel, Davenport, Iowa.

eration and interest you as managers evidence in the work that will get results from your safety organization and your entire personnel."

Discussion of Mr. Koehler's paper brought out that on most properties where safety principles have been adopted, safety meetings are always held on company time in order to assure good attendance. They should be brief and to the point and the appeal should always be made to the employees' reason. A representative of the Pittsburgh Railways announced with some degree of pride that employee suspensions had been abolished on his property. On the question of compensation for safety suggestions, Mr. Koehler declared that this practice had not been established in Milwaukee.

SAFETY IS COMMON GROUND BETWEEN UTILITY AND PUBLIC

In an address made by Col. E. C. Springer, general manager Lehigh Valley Transit Company, Allentown, Pa., safety was declared to be the only common ground on which the public utility and the general public can meet and converse in the same language. "Safety will win the friendship of the public where politics fails," Colonel Springer asserted. "Safety work can be made a tremendous factor in strengthening public relations, through co-operation with chambers of commerce, motor clubs, community and civic organizations, the radio, newspaper and other local agencies."

Safety is also a potent factor for efficiency and production in every industry, the speaker maintained, but as such has been singularly neglected by the electric railway industry. "Our industry can derive a large measure of profit from the heavy investment and wide experience in safety work of other industries," he declared. "The study of safety is inevitably a means to better understanding of working conditions, and, therefore, to greater efficiency in production."

"Unlike the experience of most industries," said Colonel Springer, "the experience of electric railway operators has been that safety must work from the executive staff down, hence the management must be completely sold on the idea. Only when it is strenuously and consistently promoted can safety work produce the desired results." In successful accident prevention work, he pointed out, proper selection of men, thorough dissemination of knowledge, and a fair and reasonable policy of discipline are the most important factors. Inasmuch as reduced cost of operation is one of the outstanding problems of the electric railway industry today, safety committees should be constantly on the watch for waste and carelessness.

That newspapers throughout the country publish a daily safety story in an effort to reduce the annual toll of 90,000 lives in traffic accidents as well as to inform the public of the work being carried on by all industry to relieve this situation, was the suggestion made by P. J. McGrath, international fifth vice-president of the Amalgamated Association of Electric Railway Employees of America. In urging that every wage worker should be a safety engineer, Mr. McGrath asserted that every employee should be given every possible opportunity to participate in the work of advancing his own safety and that of others. The wage worker has greater interest in safety than any other because he cannot afford lost time. "The best safety comes when all factors of the public utility industry—the investor, the management, the employee and the public—harmonize in watchfulness and when a spirit of co-operation and confidence binds them closely together."

Mr. McGrath also reported that the street car men's union was fully alive to the value of safety work, and that at the last annual convention of the Amalgamated Association resolutions had been passed urging co-operation of employees with the management in this work and that an official delegate be sent to the present congress of the National Safety Council.

LESS EMPHASIS ON SPEED

J. S. Kubu, assistant superintendent accident department, Cleveland Railways, took the interesting stand that automobile manufacturers should be restrained from emphasizing speed in their advertisements and that laws should be enacted restricting the manufacturer from producing cars capable of being driven at "insane" speed. The psychological effect of the speed advertisements on the public mind, especially its impression on the minds of young people, Mr. Kubu said, is probably very directly linked up with the appalling number of automobile accidents.

Other suggestions made by Mr. Kubu in the interest of reducing collisions between vehicles on city streets embraced the adoption of public liability laws to keep the driver of the cheap car and the driver who has had frequent accidents off the highways; the estab-

lishment of a uniform system of physical and intelligence examinations and comprehensive road tests for all drivers; the widespread dissemination of knowledge on accident prevention and the establishment of a uniform code of justice for traffic violations.

"Many good things have been said about safety activities," concluded Mr. Kibu, "but specific things must now be done. Safety organizations must be more thoroughly co-ordinated and then we must open the public's eyes to the human relationships involved in accident prevention measures."

Leading off the discussion on Mr. Kubu's paper, E. K. Eastham, safety director United Railways of St. Louis, voiced the opinion that the electric railway industry should be represented at all national and state traffic and safety conferences in order to see that our point of view is adequately and clearly presented. He also recommended that the laws which were framed by the Hoover Conference on Motor Vehicle Laws be passed in every state of the union. Thomas Fitzgerald, vice-president Pittsburgh Railways, favored the Hoover laws in general but expressed the belief that if autos were to be prohibited from passing standing street cars at loading points excessive traffic congestion would result. Instead of such a rigid regulation, Mr. Fitzgerald held that it would be better to permit autos to pass when driven slowly and carefully and only when sufficient clearance allows. Mr. Eastham agreed that this practice would be satisfactory if adequately protected safety zones were to be provided. Representatives of the street railway properties in Providence, Pittsburgh and St. Louis declared that yellow street markers are used to indicate the sweep of cars on curves in their cities, and a delegate from the Des Moines City Railway suggested that in order to assure better treatment for the company in court, the arbitrary term of "safety zones" should be changed to "loading zones." The motion that a committee be appointed by the chairman of the electric railway section to investigate compulsory liability insurance and to report its findings to the section was lost for want of a second.

STREET ACCIDENTS INCREASING

In a paper entitled "A Statistical Review of the Accident Experiences of Electric Railways," G. R. Whitmore, general claims attorney Illinois Power & Light Corporation, presented a table of accident statistics gathered from more than 100 city and interurban railways and motor coach properties in all parts of the country. His figures indicated that while there had been a marked decrease in the past five years in the number of interurban railway accidents, due to increasing street congestion, accidents on city lines are steadily gaining, and that the average car-miles per accident show similar tendencies. (See tables above.)

Mr. Whitmore remarked that in the light of records shown by his tables, electric railway managements are to be

ELECTRIC RAILWAY ACCIDENT AND PERSONAL INJURY FREQUENCY, EXPRESSED IN CAR-MILES PER ACCIDENT AND PER INJURY

Year and Number of Reporting Companies	Average All Accidents	Collisions		Injuries			
		Motor Vehicle	Car	Average All	Passenger	Employee	Other Persons
1922 (104)	3,030	6,380	146,940	14,250	25,040	62,320	70,490
1923 (104)	2,800	5,600	124,280	14,250	25,730	58,440	70,460
1924 (105)	2,610	5,150	123,770	13,780	24,820	96,220	45,620
1925 (113)	2,750	5,030	149,250	13,660	28,050	68,450	43,110
1926 (113)	2,680	5,110	115,040	13,880	26,620	84,480	44,270
57 City Companies							
1925	2,420	4,770	117,920	13,640	26,630	74,380	44,760
1926	2,380	4,710	111,950	12,970	24,250	81,580	42,310
13 Interurban Companies							
1925	11,890	25,020	346,060	56,110	241,620	110,150	217,110
1926	12,100	24,850	550,480	58,610	183,490	136,400	233,530
43 Companies, Combined City and Interurban							
1925	3,870	6,590	184,960	16,500	37,340	82,110	46,140
1926	3,630	6,020	167,890	15,480	32,060	88,940	45,080

BUS ACCIDENTS, BUS-MILES PER ACCIDENT AND PER PERSONAL INJURY

Year and Number of Reporting Companies	Average All Accidents	Vehicle Collisions	Injuries			
			Average All	Passenger	Employee	Other Persons
1925 (20)	4,780	10,670	10,720	38,960	91,020	17,660
1926 (20)	4,520	9,510	10,510	34,000	75,170	19,090
10 City Companies						
1925	3,660	7,730	7,400	30,180	56,870	11,840
1926	3,750	7,940	8,510	32,920	49,380	14,960
4 Interurban Companies						
1925	11,850	16,070	278,540	835,630	1,671,270	557,090
1926	14,620	22,760	179,840	359,670	899,180	599,460

congratulated. "The fine work on the part of these companies," he said, "is keeping other accidents down. But let us not stop here; it should be our aim to establish a mark of 5,000 miles per car accident, and then to strive earnestly to add at least 1,000 miles per car-mile per year thereafter."

In the discussion which followed this paper, H. R. Hodgson, East St. Louis Railway, brought up the question of uniform accident reports, declaring that many companies differ as to what constitutes chargeable accidents, and that as a result, national accident statistics are often misleading. Commenting on Mr. Hodgson's statement, E. K. Eastham, chairman of the section's committee on uniform accident statistics, announced that a resolution embodying the following recommendations had been filed with the claims section of the American Electric Railway Association: (1) that every accident, including non-chargeable cases, be recorded in the figures sent out by each company to central bodies; (2) that such uniform records shall be kept for inter-company use only and shall not be permitted to interfere with intra-company methods.

At the general round-table discussion following these talks questions regarding proper colors for cars operated at night and during heavy fogs; suitable air pressure, and the relative advantage of the one-man car were treated at length, although no general conclusions were recorded on any subject. H. K. Bennett, safety manager United Electric Railways of Providence, extolled the virtues of the white and yellow cars used on his company's lines. A. R. Bowman of the Milwaukee Electric Railway & Light Company suggested his company's combination of red and yellow as a means to greater visibility, while others suggested all white or all yellow, or the use of floodlighted dashers.

Replying to E. D. McMorrow's criticism of the one-man car on the ground that too many duties are simultaneously required of the operator, Mr. Shaw of the Akron, Ohio, property asserted that larger responsibilities have made the operators of one-man cars much more careful and efficient. In Akron and Canton, Ohio, he said, 100 per cent one-man operation has resulted in the same headway and average speed of cars being maintained as had been possible with the old two-man equipment, that there have been fewer accidents and that the men like the one-man cars better than those formerly used. Members of the Pittsburgh, Providence and Milwaukee delegations reported similarly satisfactory results from one-man operation. Mr. Fitzgerald of Pittsburgh told the meeting that it was the one-man car that had saved the insolvent Pittsburgh Railways and that while the speed of one-man cars on his property is slightly lower than that of two-man equipment, there has been a decrease in the number of accidents.

That no fixed standard should be prescribed for air-pressure condition was the opinion of the majority of those who entered into the discussion. While 60 lb. pressure may be adequate in some cities, Pittsburgh representatives felt that 90 lb. was more nearly the standard on their properties, but they admitted that the whole question depended upon local operating conditions.

Concluding the three-day meeting of the electric railway section was a talk on "Utilizing the Radio," by H. K. Bennett, safety manager United Electric Railways of Providence, R. I., and originator of the now famous "Uncle Red's A.B.C. Club of Providence." Mr. Bennett told of the idea which resulted in the formation last November of the children's radio club, now

boasting more than 135,000 juvenile members throughout the country. Tens of thousands of letters, he said, have been received from these children in which they pledge to abide by the simple common-sense rules of the club. The influence of his radio talks has also spread to many parents and teachers with the gratifying results that the number of accidents to children in the state of Rhode Island has shown a notable decrease.

THE NEW OFFICERS

At the close of the session on Sept. 29, the following officers were elected for the ensuing year: Chairman, A. W. Koehler, superintendent of accident prevention Milwaukee Electric Railway & Light Company; first vice-chairman, H. K. Bennett, safety manager United Electric Railways, Providence, R. I.; second vice-chairman, E. K. Eastham, safety director United Railways of St. Louis; third vice-chairman, Melvin W. Bridges, safety engineer Chicago Rapid Transit Company; secretary, J. E. Stott, Georgia Power Company, Atlanta, Ga.

Members of the electric railway section elected to offices in the National Safety Council for the year 1928 were: George T. Hellmuth, general claims attorney North Shore Line, treasurer, and M. R. Brabson, Birmingham Electric Company, Birmingham, Ala., director.

Iowa Operators to Meet Nov. 23

OPERATING and maintenance sections of the Iowa Electric Railway Association will hold their annual meeting at the Blackhawk Hotel, Davenport, Iowa, on Wednesday and Thursday, Nov. 2 and 3. It is planned to have a number of good speakers and to make this an even better convention than was last year's.

A.E.S.C. Standards of Interest to Electric Railways

THREE important standards dealing with electric railway practices have recently been approved by the American Engineering Standards Committee. The first is a standard specification for tubular steel poles for electric line construction. The importance of this standardization work may be understood when it is considered that 1,400 combinations of tubular steel poles have been shown in a catalog of a single company, while sixteen are sufficient to meet practical commercial needs. A simple table of deflections has been prepared for use in designing the poles based on a regular theoretical point. The specifications are believed to apply to all tubular steel poles, no matter by what process manufactured.

The second standard is a group of three 7-in. plain girder rails and splice bars for use in paved streets. The rails weigh 82, 92 and 102 lb. per yard.

Approval of standard specifications for cross ties and switch ties marks the completion of an important piece of

work extending over a period of years, during which time the steam railways and electric railways have co-operated

on this subject of common interest. About 100,000,000 ties are produced annually in this country.

American Association News

New Executive Committee Begins Year's Work

PRESIDENT R. P. STEVENS presided at the opening meeting of the new executive committee of the American Electric Railway Association, which was held at the Cleveland Hotel, Cleveland, Ohio, on the afternoon of Oct. 6. The following were recorded as present:

R. P. Stevens, J. P. Barnes, J. H. Hanna, C. E. Morgan, Lucius S. Storrs, Barron Collier, W. H. Sawyer, Edward Dana, T. A. Kenney, M. B. Lambert, S. J. Cotsworth, Charles R. Ellicott, H. L. Brown, T. W. Casey, D. W. Snyder, J. G. Barry, J. R. Fitzpatrick and J. W. Welsh, active members; F. R. Coates, J. N. Shannahan, Robert I. Todd and A. W. Brady, past-presidents; W. W. Holden, representing the Southwestern Association; Labert St. Clair, J. W. Colton and Leslie Vickers of the association staff.

On motion of Mr. Barnes, the minutes of the last meeting were approved without reading, with the understanding that they would be mailed to members.

On motion of Mr. Barnes, seconded by Mr. Cotsworth, J. W. Welsh was elected general secretary for the ensuing year.

President Stevens introduced the new members of the executive committee who were present.

Mr. Shannahan stated that the resolutions presented at the general session of the association in the morning covered the thanks of the association to all those responsible for the convention and exhibit, except the director of exhibits, and he moved that a special vote of appreciation be extended to him on behalf of the executive committee. This was seconded by Mr. Barnes and unanimously carried.

SUBJECTS FOR COMING YEAR

H. L. Brown, chairman of the committee on subjects and meetings, presented a progress report covering the proposed work of committees for the coming year. Under consideration are a committee on customer relations, a committee on industrial relations, a national women's committee and a traffic problem committee. The committees definitely recommended for continuance are the following: Co-operation with the motor vehicle industry; co-operation with manufacturers; co-operation with state and sectional associations; education; insurance; management and operation; rapid transit; taxation; Charles A. Coffin Award; Hoover conference; motor vehicle information; motor bus depreciation.

In certain instances last year's committees have recommended work for the

coming year, while others have not. It was also definitely recommended that the new subjects and meetings committee continue at the next convention the round-table luncheon conferences. On motion of Mr. Storrs, the report of the committee was accepted with a further recommendation that it favorably consider the general plan of holding the type of convention meetings adopted this year. This was seconded by Mr. Barnes and unanimously carried.

Mr. Shannahan moved that the committee express its appreciation of the excellent work done by the meetings and subjects committee, stating that he could not recall any committee that had done better work. This was seconded by Mr. Sawyer, who stated that this committee stood out as leading in the conduct of the convention. The motion was unanimously carried, the president stating that he planned to continue the same committee for the coming year.

COMMITTEE CHAIRMEN ANNOUNCED

President Stevens announced the chairmen of the following committees for the coming year, as follows:

Advisory Council, B. C. Cobb; policy, J. P. Barnes; meetings and subjects, H. L. Brown; publicity, Paul Shoup (Barron Collier, vice-chairman); membership, C. E. Morgan; finance, T. A. Kenney; national relations, J. H. Hanna; publications, J. H. Hanna; publication of *Aera* (sub-committee), H. V. Bozell, statistics (sub-committee), F. W. Doolittle; convention location, F. R. Coates (J. G. Barry, vice-chairman); co-operation with state and sectional associations, T. A. Kenney. Additional appointments are to be made in the near future.

Resolutions on the death of Charles L. Henry were read by Mr. Welsh. After the reading, A. W. Brady, chairman of the resolutions committee, suggested changing the resolutions to indicate that they were adopted by the executive committee instead of by the association. On motion of Mr. Brady, seconded by Mr. Storrs, these motions were unanimously adopted.

PLANS FOR 1928 CONVENTION

There was considerable discussion as to whether an exhibit should be held in 1928, in view of the suggestion that exhibits should be held in alternate years. The possibility of holding the convention on the Pacific Coast in 1930, when it would be difficult to hold an exhibit, was considered in connection with the possibility of not holding an exhibit in 1928. The question of the expense to the manufacturers and the

difficulty of measuring the value to the manufacturers was presented, and that this all was reflected in an increased cost to the industry. Counter arguments were presented to the effect that much of the inspiration and interest on the part of the membership was due to the exhibit, particularly among the junior officers of companies. The possibility of the new convention hall at Atlantic City being completed was presented and the desirability of having an exhibit there in 1928 was suggested. The need for canvassing the manufacturers broadly, particularly the smaller ones, was also suggested. The possibility that more numerous meetings and round-table conferences might take the place of the exhibit was suggested.

As no action had been taken on the recommendation of last year's finance committee that the dues be fixed for the coming year on the basis of the maximum prescribed in the new constitution, the report of that committee was read. There was some discussion on the basis underlying the budget for the coming year, as recommended by the finance committee in last year's report. On motion of Mr. Barnes, seconded by Mr. Casey, the report of the finance committee was approved. Mr. Barnes then moved that the dues for the coming year be fixed on the basis recommended by the finance committee. The motion was seconded and unanimously carried.

On motion of Mr. Barnes, seconded by Mr. Storrs, the price of an annual subscription to *Aera* was continued at \$2.

There was some discussion as to the best date for the next meeting of the executive committee. Since some of the Western members expected to be in New York for other reasons on Nov. 12, it was agreed that the next meeting be held in New York City on Friday, Nov. 11.

There being no further business, the meeting adjourned.

OLD EXECUTIVE COMMITTEE COMPLETES WORK

The final meeting of the old executive committee, which was held at Cleveland on Oct. 3, to check last minute arrangements, failed to develop a single oversight which might mar the smooth functioning of the convention, it was said.

Reports on luncheon meeting ticket sales indicated that all of these affairs were sold out early, the attendance being limited to a specified number. Arrangements were made to take moving pictures of this event and to show them at the theater party Wednesday night.

Reports of all standing committees were made during the meeting. That of the membership committee, made by C. R. Ellicott, chairman, indicated a total company and manufacturer membership of 802, the largest on record for the association. Individual memberships likewise showed an increase of 144 for the year. Fifteen company members and 22 individual members were elected, as reported in more detail elsewhere in this issue.

The financial condition of the asso-

ciation for the fiscal year just ended is a healthy one, according to the report of the finance committee, presented by C. E. Morgan, chairman. This committee recommended that the schedule of dues, suggested by the committee on revision of constitution and by-laws, be adopted. Although this represents a substantial increase in the former regular dues of member companies, it consists merely of a consolidation of the former dues with former revenues received by special assessment, and originally underwritten by the Advisory Council upon the formation of that body.

Resolutions Adopted at Cleveland

RESOLUTIONS of appreciation in connection with the past association year and particularly regarding the annual convention were prepared by a committee appointed for the purpose, consisting of J. N. Shannahan, chairman; G. A. Richardson, W. E. Wood, J. G. Barry and T. W. Casey. These resolutions, which were adopted unanimously by the American Association, follow:

Resolved, That the American Electric Railway Association, assembled in its 46th annual convention, express its appreciation of and gratitude for the untiring, enthusiastic and inspiring co-operation of those who have had a part in making this convention so notable in the annals of the association.

Especially are we indebted to the Cleveland convention committee for the successful manner in which it carried through the difficult task assigned to it. To the chairman, Col. Joseph H. Alexander, we express our heartfelt thanks. To the people of the city of Cleveland and to the officials of Cleveland who welcomed us and made us feel that we were indeed among warm-hearted friends we offer our cordial appreciation. To the City Manager of Cleveland, in particular, to the executive officers of the Auditorium, to the hotel managements and the various contractors who supplied the convention with services we express our gratitude.

We extend our thanks to the Cleveland Railway for its wonderful assistance in making this convention such a success, not only because of the manner in which it handled the placing of cars and other details of the exhibit, but also for its contribution to the entertainment program and for the many courtesies which it and its representatives have shown us.

And to the Pittsburgh Railways is due our deep appreciation for its co-operation in sending to us the magnificent Pittsburgh Railways Employees' Band, an organization that well deserves the high place it has attained among American bands.

We thank the Cleveland newspapers for the completeness of their reports of our sessions, and especially for the accuracy and intelligent understanding of our business evidenced in the work of the reporters assigned to our convention.

We are indebted to the committee on meetings and subjects for arranging a most interesting and valuable program, and to the distinguished speakers who were our guests for their able discussion of the problems that confront us and the help they offered us in meeting them.

The exhibit committee, in preparing for us the greatest exhibit in the history of the association, and particularly for its work

in bringing about the great display of street cars through the fine co-operation of manufacturers and operating companies, deserves our warmest thanks, which are hereby recorded.

We extend to the entertainment committee our thanks for the excellent program which it prepared and so carefully supervised.

To the efficient work of our executive secretary, James W. Welsh, and the association headquarters staff we give hearty recognition.

Our thanks are extended to the *ELECTRIC RAILWAY JOURNAL* for its Convention Daily.

We renew our confidence in, affection for and loyalty to our managing director, Lucius S. Storrs, and we pledge him our fullest co-operation in every way in his most important and difficult work.

To our Advisory Council and its chairman, B. C. Cobb, we express our gratitude for its counsel and advice during the year.

Our thanks and appreciation are extended to our retiring president, W. H. Sawyer, for the sacrifices he so willingly made during his term of office. He has journeyed many hundreds of miles to visit state and sectional associations and has carried to them the enthusiasm and encouragement with which he abounds. There is no man who believes more earnestly in the electric railway industry or who has striven harder for what he believes to be for its best interest.

To all others who have in any way contributed to the success of this great convention and exhibit we are sincerely grateful.

We ask that this resolution be spread upon the minutes of the association and a copy sent to the trade press and the Cleveland newspapers.

New Association Members

FIFTEEN companies and 22 individuals were elected to membership in the American Electric Railway Association at the meeting of the executive committee held on Oct. 2 in Cleveland. The company members include two operating companies, one associate and twelve manufacturers. A list of the company members elected follows:

OPERATING COMPANIES

Lake Erie & Northern Railway, Galt, Ont., Canada.

London Street Railway, London, Ont., Canada.

ASSOCIATE

N. D. Ballantine, consulting engineer, New York, N. Y.

MANUFACTURER COMPANIES

Aqua Oil Service, Inc., New York, N. Y.
Binks Spray Equipment Company, Chicago, Ill.

Brooks Steam Motors, Ltd., Stratford, Ont., Canada.

R. W. Cramer & Company, New York, N. Y.

Crew-Levick Company, Philadelphia, Pa.

Hannum Manufacturing Company, Milwaukee, Wis.

Laconia Car Company, Laconia, N. H.

Lebanon Steel Co., Lebanon, Pa.

Shuler Axle Company, Louisville, Ky.

South Bend Lathe Works, South Bend, Ind.

United States Air Compressor Company, Cleveland, Ohio.

Wiener Body Company, Newark, N. J.

News of the Industry

Another Franchise Draft Soon for St. Louis

Mayor Victor J. Miller of St. Louis, Mo., has stated that he hopes to be able Nov. 15 to present to the Board of Aldermen an ordinance for enfranchisement of the United Railways under a service-at-cost plan. Mayor Miller indicated that the new measure will differ little from his former service-at-cost plan, abandoned this summer because the city officials and the reorganization committee of the railway could not agree upon the questions of valuation and rate of return.

Alderman Samuel L. Wimer has presented to the Board of Aldermen a resolution calling for another aldermanic inquiry into the problem of transportation in St. Louis. Alderman Wimer says the purposes of his proposed inquiry are:

1. To consider "this scheme to grant a service-at-cost franchise" and its effect upon the development of any system of rapid transit which later may be devised.
2. To learn what bearing a franchise of this kind would have on any future plan under which the city might desire to acquire and operate these surface lines on its own account.
3. To determine the feasibility of the city acquiring and operating the surface lines at this time.

The committee of three proposed by Mr. Wimer would include him as chairman of the board's special committee on Rapid Transit, Edward Wiehe, chairman of the board's committee on public utilities, and President Neun. The board cannot appoint to its committees non-members, but Mayor Miller, Comptroller Nolte, City Counselor Muench and E. R. Kinsey, president of the Board of Public Service, are formally invited to sit in with the committee.

San Francisco Votes to Retain Delos F. Wilcox

In the face of the assertion by Nelson Eckart, assistant city engineer, that the appointment was illegal, supervisors of San Francisco, Cal., by a vote of fifteen to three overrode Mayor Rolph's veto of Delos F. Wilcox's designation as an expert to make a 60-day survey of the local street railway situation.

In addressing the supervisors Mr. Eckart declared that the appointment of Mr. Wilcox is a violation of the city charter. He quoted a section of the charter which provides that work connected with the operation of any public utility owned or controlled by the city must be certified as necessary by the city engineer. Further, Mr. Eckart pointed out that the appointment of Mr. Wilcox had been opposed by City Engineer O'Shaughnessy, who had advised

the Mayor to veto the measure appointing him.

Court action may follow as a result of the veto upset, but at any rate the matter will be put up to the voters on Nov. 8.

Mayor Rolph has drafted an ordinance to be voted on by the electorate proposing that the Board of Public Works shall appoint a commission of three members to study and report upon the valuation of the physical properties of the Market Street Railway and investigate the situation confronting the city at the expiration of the company's

franchises. The three would be selected from a list of 24 names, six each to be submitted by the presidents of the University of California, Stanford and Santa Clara Universities and St. Mary's College. The three members finally selected would make their report in 90 days and it is stipulated that their recommendations must provide for maintenance of a 5-cent fare within the city limits of San Francisco with half fares for school children. The Mayor has power under the charter to put this ordinance on the ballot.

Committee Approves New Chicago Bills

Three of the five measures intended to help unification program are advanced by Aldermanic action—Two more measures to be considered—Full program expected to go before board at an early date

THREE of the five new bills representing the city of Chicago's views as to the kind of legislation needed to settle the local transportation problem were formally approved on Oct. 11 by a sub-committee of the City Council committee on local transportation. Modeled after the original company bills, which failed to pass at the last session of the Legislature, the new bills were drawn up several weeks ago by James W. Breen, assistant corporation counsel. The three measures which were approved are the subway bill, the bill providing for the consolidation of surface, elevated and bus lines, and one creating a local transit commission. The other bills, which amend the cities and villages act to allow franchises of more than twenty years and provide for the issuing of terminable permits, are expected to be approved in a few days.

In the new subway draft the provision of the original bill, that the cost of relocating public utility pipes and conduits in connection with subway construction should be borne by the city and charged to the cost of building the tubes, has been changed to give the city the option of standing the expense and charging it to subway cost or to put the cost of the work on the utilities themselves.

In the local transit commission bill the Aldermen stood by their original plan of almost complete home rule by recommending a transit commission of five members, four to be appointed by the Mayor of Chicago and the other to be selected by the president of the county board of commissioners. In the bill initiated by the companies last summer the Governor was to have named two, the Mayor, two and the county board president, one.

The consolidation bill, as approved by

the sub-committee, is practically identical with the original company measure, providing for the formation of a single transportation company to operate elevated, surface and bus lines and the subway system, when it is built. This bill would permit the elevated lines, which are incorporated under the state railroad act, to purchase and operate the surface lines and the bus lines, but would not give the same right to the street car company.

When the last two bills are approved by the sub-committee they will be submitted to the full local transportation committee, which will consider recommending them to the City Council for adoption. When the last-named group is presented with the drafts representatives of the railways and their bankers will be called in to reject, modify or accept the bills.

Boston Elevated to Open New Dorchester Line Nov. 5

Work is so far advanced on the building of the new Dorchester rapid transit line, which will be the newest part of the Boston Elevated system, Boston, Mass., that a part of it will be opened for service on Nov. 5. The Boston Transit Department, which is building the line, announces that the section from Andrew Square to Field's Corner will be ready for service on that date and has petitioned the Public Utilities Department to authorize the New York, New Haven & Hartford Railroad to close the Savin Hill station on Nov. 1 so that the Boston Elevated Railway may turn the power into the third rail on that date and allow the Elevated officials and employees three days to try out the new line and familiarize them-

selves with the signals, curves and station platforms before carrying any passengers. There will be an official inspection of the line on Nov. 4.

This is the section, a third-rail rapid transit line, which will take the place of the steam railroad, the right-of-way having been bought from the New York, New Haven & Hartford Railroad, which is to abandon the passenger service when the new line is built so that the Boston Elevated can take it over. In planning for this extension of the Elevated system it has been assumed that the short-haul suburban passenger traffic can be handled more economically by a railway than by the steam railroads. The railroads coming into Boston have been talking about abandoning the suburban service.

Fare Hearings on California Petitions Set for Dec. 6

The hearing before the California Railroad Commission on the application of the Pacific Gas & Electric Company for a 7-cent fare in Sacramento, Cal., was resumed on Sept. 28. Considerable data were submitted on the valuation of the system and cost of operation of cars. Resumption of the hearings has been set for Dec. 6.

This date was made to allow for time to study the exhibits filed by that company and by the Central California Traction Company, San Francisco, Cal., which also is petitioning for an increase to 7 cents. The city is fighting the proposed increase of 2 cents on the lines within the city, while the district attorney's office is interested in the increase on the railway company's lines which run outside the city limits.

Citizens Abandon One-Car Road

Three weeks of trying to run a railway and make it pay is enough for the citizens of the little town of Philley's, Ind., so they have returned the line to its original operators and are retiring to less arduous occupations.

The town of Philley's adjoins the city of Fort Wayne on the southeast and is located on the interurban line running between that city and Decatur. When the Indiana Service Corporation, which has operated the insolvent Fort Wayne & Decatur Traction Company for some time, recently decided to abandon the service to Decatur the residents of Philley's were greatly incensed. So the Indiana Service Corporation turned over to the Philley's Community Association that portion of the line between Philley's and Fort Wayne and gave them a single street car to operate. The line was leased to the community with the understanding that it would be operated and maintained by the citizens, at a rental of \$1 a year.

After several weeks of operation, however, the amateur utility men discovered the receipts were insufficient to pay the lone motorman so the line was handed back to the company and will soon be abandoned.

Council Heckling Tacoma Company

The City Council of Tacoma, Wash., recently passed a resolution directing the Tacoma Railway & Power Company to pave between its tracks on McKinley Avenue from 40th to 64th Streets and to complete its double tracking between 35th and 40th Streets on McKinley Avenue. The Council was advised by Corporation Counsel E. K. Murray that it was justified legally in taking such action. The company planked between its tracks according to an agreement with the city in 1921, which permitted planking in view of double tracking, and the company was to pave when financially able to do so. The resolution was adopted after frequent complaints had been received by the city from residents on McKinley Hill over the condition of the planking.

The Council also instructed the company to pull up the remainder of its tracks on Commerce Street. This work was halted due to an altercation over whether the ties should come up too after the company had completed the distance between Seventh and Ninth Streets.

A letter from Richard T. Sullivan, manager of the company, held that the Council's interpretation of the agreement to pave between 48th and 56th Streets on Yakima Avenue was unfair, and the company withdrew its consent to pay for any portion of it.

Jitney Decision Awaited in Columbia

Columbia's railway case, more or less in the public eye since last March, when the cars operated by the Columbia Railway, Gas & Electric Company were withdrawn, is now before the State Supreme Court.

Some time after this action by the company in suspending operations the Attorney-General instituted mandamus proceedings requiring the resumption of service. Several "intervenor" added their petitions to that of the Attorney-General. Among them were the Columbia city school board, the towns of Arden and Eau Claire (suburbs of Columbia and heretofore served by the railway), Columbia College, land development companies and others. All of these contend that the discontinuance of railway service is injurious to the city's welfare, that the street car is the best and cheapest mode of transportation and that the utility is under obligation to continue service despite the fact that it makes no money.

The company's position is that it lost money steadily during the latter several months of its operations and that to force it to operate would mean still further loss.

The Supreme Court, after hearing the case, has taken the petition for a mandamus under advisement and will likely hand down a decision soon.

At present the city is served by two systems of public transportation—neither

very satisfactory. Buses operate on definite routes and are supposed to run on schedule. Their fare is 10 cents and they are not heavily patronized. Ten-cent jitneys operate without any regulation. They cover no definite route and go off the streets when they are so disposed to take passengers to their doors or to their offices. These vehicles are fairly well patronized. The jitneys are privately owned, some transfer only whites and others only negroes. Practically 95 per cent of them are Fords. The licenses for the jitneys change hands often.

One-Man Operation Extended by Connecticut Company

One-man car operation has been extended by the Connecticut Company at New Haven to the Lighthouse line, the Branford and Stony Creek runs, Momauguin and to the Country Clubs. This leaves two-man car operation on the Shelton Avenue line, the Winchester-Grand Avenue, State-Congress Avenue, New Haven-Waterbury, Dixwell Avenue-Savin Rock, and the Bridgeport runs. It is expected that these lines will follow into the one-man class before many months, for it is understood to be the intention of the company to operate 100 per cent of the cars in New Haven with one man. With the operation of one-man cars on the Branford, Stony Creek, East Haven and Momauguin lines a new system for fare collection went into effect. On east-bound trips from New Haven passengers pay as they leave the car. Passengers boarding cars beyond the first fare limit receive identification checks to show the number of the fare limit in which they have boarded the car. On the westbound trips to New Haven passengers, as they enter the car pay full fare from the point they board the car to their destination, and receive identification checks showing the number of the fare limit through which they have paid. Passengers return the identification checks to the operator when they leave the car. Passengers without checks are obliged to pay full fare to the point at which they leave the car.

Co-operation Between Savannah Utility and Education Board

The Savannah Electric & Power Company, Savannah, Ga., will co-operate with the Board of Education to consider transportation problems for pupils who live outside the city limits. Out of a recent meeting came a definite proposition for the making of a school survey of Chatham County. The company agreed to submit figures for the employment of a special car to carry the children from the Fort Wentworth section into the city and carry them back after school hours. As soon as these figures are obtained the committee will hold another meeting and formulate a report to the Board of Education.

\$30,000 Toward Portland Viaduct

The Oregon Electric Railway is to pay \$8,000 toward the cost of a \$30,000 viaduct over its tracks at Roland Street, Portland, Ore. The agreement specifies that the amount will be paid in full by the company within ten days after notification by the city engineer that the viaduct has been completed, the company to be free of all liability of the railway toward the structure.

Oakland Hearing to Be Resumed on Nov. 2

The hearing before the Railroad Commission concerning permanent rates for the local and transbay lines of the Key System Transit Company, Oakland, Cal., will be resumed by Commissioner Clyde Seavey on Nov. 2. The arguments have been held from time to time, and at the last hearing the Key System broached a plan for a "pass" system with a 10-cent cash fare. This matter is still under consideration.

Would Dismiss Suit for 5-Cent Fare in Philadelphia

Motions were filed in U. S. District Court by the Public Service Commission and Philadelphia Rapid Transit Company, Philadelphia, Pa., for dismissal of the equity suit for restoration of the 5-cent fare. The motion is based on grounds that the federal court has no jurisdiction in the case, and for the further reason that the fare advances, approved by the Public Service Commission, were consented to by the parties to the 1907 city-P.R.T. agreement.

"Vepcovian" Will Appear in Richmond

The November issue of the magazine published for employees of the Virginia Electric & Power Company, Richmond, Va., will appear under the name *Vepcovian*, it has been announced by A. H. Herrmann, the editor. A contest was held to secure a name for the publication, and *Vepcovian* won in a field of 90 entries. J. Morris Hardy, Norfolk, an employee of the accounting department of the company, won \$10 in gold for the suggestion.

Out for Prizes in Jacksonville

Employees of the Jacksonville Traction Company, Jacksonville, Fla., announced recently that they would compete for the prizes to be offered to the Stone & Woster, Inc., owned or managed property in Georgia and Florida, which shows the most efficiency in keeping cars in repair while in service. The winning company must lower the record established for the smallest number of street cars which are brought into the

shops for repairs while in service. Awards will be made by Alba H. Warren, district manager in Savannah.

Kansas City "Dad" Retires

"Dad" Nelson, veteran motorman at Kansas City, Mo., recently retired after 42 years of service. Almost a half century ago he entered railway service as a gripman for the old Kansas City Cable Railways. The *Railwayman*, the official paper of the Kansas City Public Service Company, states that his leaving brought many expressions of regret. It said that twice in his street car career he was responsible for the saving of the lives of his passengers. "Dad" is 79 years old, but appears much younger.

Employees Can Tip Company Off on British Columbia Business

"How the Employee Can Help," which appeared in the July issue of the British Columbia Electric employees' magazine, has been reprinted in pamphlet form, inside of which is the new business form designed to secure new business for the company. On this form employees can give any information they want on prospective customers for chartering coaches or cars, for parcel express by rapid transit and for electric railway freight services.

Examiner Reports Against Piedmont Project

An Interstate Commerce Commission examiner has recommended in a tentative report that the commission deny the application of the Piedmont & Northern Railway for authority to construct a line of railroad from Spartanburg to Gastonia, S. C., a distance of 53 miles, and another line from Charlotte to Winston-Salem, N. C., a distance of about 75 miles. The examiner held the proposed construction would result in an unwarranted duplication of existing railways, would impair their facilities by diverting their traffic, would not open any through routes that are not now available and would perform no transportation service of importance that cannot be performed by lines that now exist.

The commission will pass upon the recommendation before making a final decision. The Southern Railway and other carriers protested that the line was unnecessary and further asserted that the Duke power interests, controlling the Piedmont company, desired to build the railroad largely for the purpose of controlling traffic.

The Piedmont company contended that it had projected its extension prior to the passage of laws under which the commission controls railroad consolidation and, further, as an electric interurban, it was not under the commission's supervision. Both of these claims were held invalid by the examiner's ruling.

Planners to Study Route in Oklahoma City

Members of the City Planning Commission of Oklahoma City, Okla., are studying the route of the proposed belt line railway for the city. The plans were recently submitted to that commission by Hubert Hudson, president of the Oklahoma Railway. Mr. Hudson said it was desirable for the city to take sufficient time to study the plans.

Chicago Utilities Operate Radio Stations

Local and interurban transportation companies and other public utilities in the Chicago, Ill., metropolitan area under the management of Samuel Insull and associates have purchased and are now operating two local radio broadcasting stations under the slogan, "The Voice of Service to the Public." The stations, which are known as "WENR and WBCN," are operated by the Great Lakes Broadcasting Company, a newly created organization, owned and controlled jointly by the Chicago, North Shore & Milwaukee and the Chicago, South Shore & South Bend Railroads, Chicago Rapid Transit Company, Commonwealth Edison Company, the Peoples Gas Light & Coke Company, Public Service Company of Northern Illinois, Middle West Utilities Company and the Northern Indiana Public Service Company.

The two stations alternate broadcasting hours, thus making it possible to furnish continuous programs throughout the day. Both have been assigned the same wave length—228 meters or 1,040 kilocycles.

Morgan Eastman, formerly director of the Commonwealth Edison studio in Chicago, has been made manager of the two stations. He has a staff of well-known artists and announcers to aid in giving some of the best programs on the air. In addition famous radio entertainers from all parts of the country will be heard from time to time.

The "News" Established in Cincinnati

In order to keep the 15,000 citizens of the Cincinnati Street Railway City, Cincinnati, Ohio, informed as to what is happening in that city, the *News* made its appearance this month, and will appear every month hereafter. According to the first issue, it fulfills the promise made by J. B. Stewart, Jr., that there should be some means for the exchange of ideas and for keeping people acquainted all over the property. The editor is Marvin S. Gilbert. On opening up the fifteen-page pamphlet one sees the picture of Walter A. Draper, president of the Cincinnati Street Railway, and reads his hopes and ideas of "our new paper." He promises that personal items as well as business items will find a place in its pages.

Five-Cent Fares for Miami School Children

Special 5-cent fare tickets for school children of Miami, Fla., will be honored on bus and railway cars operated by the Miami Beach Railway. They are purchasable in book form, containing 40, for \$2. Applications signed by school principals will be distributed at the schools and must be presented upon purchasing the tickets.

One Pittsburgh Driver Speaks to Another

In a recent advertisement in the Pittsburgh *Post-Gazette*, the Pittsburgh Railways extended its appreciation to the taxicab and truck drivers of the city for the splendid co-operation they have shown in helping to minimize accidents to pedestrians and passengers. The railway "as one driver to another" warns the drivers not to run past open trolley doors at loading points and to remember that the trolley cannot deviate its course to avoid hitting an auto.

New Toledo Ordinance Being Drafted

Progress on a new franchise ordinance for Toledo following the basis of agreement arrived at between representatives of the Henry L. Doherty & Company ownership group and the Board of Street Railway Control for the city is expected to be rapid after the election in November. Company officials and attorneys are already busy drafting in a preliminary way the new ordinance. There is some hope that it may be put through and presented to the electorate before January or early in the spring at the latest. A considerable development of new bus service depends on the new ordinance, in which it is proposed to give the railway company a virtual monopoly of all city transportation for a number of years. Closer control by the public board and commissioner would also be provided under the new plan.

Providence Men to Receive Checks

The United Electric Railways, Providence, R. I., has abandoned its trolley pay car and will mail checks hereafter to its employees. Paymaster G. B. Merchant, who knew the 2,400 employees so well, will no longer ride the cars with from \$12,000 to \$80,000 twice each week in his care. The ever-present bandit menace has forced a change from the 30-year old method.

Loops to Be Constructed in Buffalo

Attempts on the part of the Buffalo municipal authorities to prevent the International Railway, Buffalo, from constructing loops at the two ends of the Fillmore-Hertel line, which would

enable the company to establish one-man car service on this line, the last route in the city to use two-man crews, failed when Supreme Court Justice Horton authorized the railway to construct the loops.

The permit was granted by the court by dismissing the stay granted the city some time ago pending an appeal to the higher courts. The Appellate Division dismissed the application of the city of Buffalo to enjoin the railway on the ground of legal errors. For several weeks city police have been posted at both ends of the line with orders to arrest any employee of the company who attempted to start the construction of new tracks. Henry W. Killeen, of counsel for the railway, says the conversion of the line from two-man crews to one-man cars will save the International Railway \$64,000 a year.

Efforts to Collect \$25,000 for Restoration of Hocker Line

Reports have it that efforts will be made in Merriam, Kan., to raise the \$25,000 needed to reconstruct the Hocker Interurban Line and to re-establish electric railway service between Zarah and Kansas City, Mo., in accordance with the plan of Herman Sonken, president of the Sonken-Galamba Company, which purchased the line at sheriff's sale on Aug. 27 with the intention of junking it. Mr. Sonken said he believed the line could be operated at a profit under favorable conditions and that he was willing to wait a while before junking the line. He estimated that it would cost about \$25,000 to place the line in operation again, as much repair work would be necessary. The Kansas City, Lawrence & Topeka Electric Railroad, the official name for the Hocker line, operated 21 miles.

"We Have Among Us —"

In the guard of honor to greet Colonel Lindbergh on his arrival in Los Angeles, Cal., was conductor Leonard C. Price, Division 1 of the Los Angeles Railway. He was selected because of his excellent overseas record. With nine other Legionnaires he escorted "Lindy" to the Coliseum on Sept. 20.

Eight Cents in Phillipsburg

To offset a deficit said to be increasing each year, the Phillipsburg Transit Company, Phillipsburg, N. J., has been granted permission by the Board of Public Utility Commissioners of New Jersey to charge an 8-cent fare, effective Oct. 9. The old fare was 7 cents. The schedule calls for the sale of two tokens for 15 cents, and weekly passes entitling the holders to an unlimited number of rides for a period of seven days are offered at \$1.25 each. Children between five and twelve years old are carried for 5 cents, providing tickets are bought from the company in strips at the rate of twenty for \$1.

Excess Fares Cannot Be Collected by Missouri

Federal Judge Faris in St. Louis on Sept. 30 denied the State of Missouri the right to sue Receiver Rolla Wells of the United Railways, St. Louis, Mo., for \$85,000 excess fares which car riders paid during the period Feb. 5 to March 28, while the company was charging an 8-cent fare under the protection of a federal court restraining order. He held to the law that the state cannot sue to collect debts due individuals when those individuals fail to press their own claims, but under the escheat statute it may sue to collect claims of individuals which have been reduced to judgments. The court pointed out that during the extra-fare period the company had issued refund script to passengers. These scripts covering the excess fare were redeemable within 60 days after the return to the lower fare, and if the car riders failed to collect the excess fare due them that was their individual right and the state could not collect the money.

Proposes Shortening Line in New York State

Following a traffic census of the bridge across the Hudson River at South Ferry Street connecting Albany and Rensselaer, N. Y., which confirmed the opinion that the bridge had reached its traffic capacity, the State Department of Public Works has requested the Eastern New York Utilities Corporation to terminate its Albany-Hudson railway lines at Rensselaer instead of at Albany. This would provide for additional space for vehicular traffic by the removal of tracks from the structure.

Officials of the company have indicated that the proposal will not meet with their approval. Use of the bridge by the cars of the United Traction Company was discontinued some time ago with the substitution of bus service at Rensselaer.

Holyoke Changes Deferred

Because of the continued objection to the proposed increase in fare rates the Holyoke Street Railway, Holyoke, Mass., the Public Utilities Commission suspended operation of the proposed changes to Oct. 15. Previously the commission had suspended the date to Oct. 1. Inability of objectors in Holyoke and Chicopee to prepare their case was given as the reason for the delay.

Despite the postponement, as much of the business as possible was taken care of at the recent hearing. President Louis D. Pellissier and Counsel William H. Brooks presented the case for the railway.

In addition to objectors from Holyoke and Chicopee, C. W. Cavanaugh appeared for the people of South Hadley. He said it was the feeling in that section that the time was most inopportune for fare increases. He thought the people should ride as cheaply in South Hadley as in Holyoke.

Recent Bus Developments

Buses Between Jefferson City and North Jefferson

Abandonment of a railway line operated by the Missouri Power & Light Company between Jefferson City and North Jefferson, Mo., including tracks at the Missouri River toll bridge at Jefferson City, was authorized on Sept. 12 by the Missouri Public Service Commission. The company was authorized to operate a bus service between Jefferson City and the railroad station in North Jefferson.

Buses have been in operation three or four months under a temporary order. The fare for the 2½-mile car trip across the river to North Jefferson has been 10 cents, including the bridge toll, and the same rate was authorized for the buses.

ter for public and city officials to decide. The bus line was operated in compliance with the bus franchise. It never had paid operating expenses and really was operated as a convenience to the people of the district served.

Lines Planned in Utica

The Utica Railways Co-Ordinated Bus Line, Inc., applied on Sept. 27 to the Public Service Commission for a certificate for the operation of a bus line from James and Dominick Streets in Rome, over five streets, under consent given by the city. The company plans to use two twenty-passenger buses and the rate of fare will not exceed that charged on the railway lines. Application was also made to the Public Service Commission for permission to operate a bus line from Baggs Square in Utica to the Cemetery loop, and returning over the same streets. The operation is to be under a city consent, dated Sept. 23, the company stipulating not to charge fares in excess of those charged on the railway.

Philadelphia Rural Transit Would Extend Line

Representatives of the Philadelphia Rural Transit Company, a subsidiary of the Philadelphia Rapid Transit Company, Philadelphia, Pa., appeared before James S. Benn of the Public Service Commission recently to ask approval of an agreement entered into between it and the Doylestown & Easton Motorcoach Company, providing for the operation of the latter corporation by the Philadelphia Rural Transit Company. C. C. Shaeffer, traffic engineer, explained that at the present time the applicant operates buses between Philadelphia and Doylestown, and the other company from Doylestown to Easton. The agreement provides for the operation of a line from Philadelphia to Easton, the equipment to be furnished by the Philadelphia Rural Company. The fare is to be \$1.85 each way. The application was referred to the entire commission for final action.

Objection to Kansas City Buses Fails

The objection of the Warwick property owners to the operation of Warwick buses on that street in Kansas City, Mo., faded Sept. 28, when leaders in the dispute failed to organize an association for the benefit of Warwick property owners. The Warwick property owners could not agree upon the new organization, nor upon whether they wanted last year's paving tax cut or the buses of the Kansas City Public Service removed. After the failure to organize, the entire plan fell through.

Fred G. Buffe, general manager of the Kansas City Public Service Company, in a statement on Sept. 24, said that the question of continued operation of buses on Warwick Street was a mat-

ter. Threats of the Indiana Service Company to withdraw city service is believed to have prompted the Council to rule against the buses.

Bus Line to Supply Service in Glens Falls

L. F. Loree, William H. Williams, officials of the Delaware & Hudson Railroad, and H. B. Weatherwax, Albany, N. Y., vice-president and general manager of the United Traction Company, are the incorporators of the Hudson Transportation Company, Inc., Glens Falls, chartered on Oct. 6 by the Secretary of State, with a capital of \$100,000. The new company, it was stated at the offices of the United Traction Company, would operate a bus line in the city of Glens Falls, N. Y., to take the place of service formerly supplied by the Hudson Valley Railroad, the abandonment of whose railway lines was authorized by the Public Service Commission a short time ago.

Expansion in Fort Worth Planned

The Northern Texas Traction Company, Fort Worth, Tex., through its manager, A. F. Townsend, has petitioned the Texas Railroad Commission for permission to purchase the Harvey Bus Line running between Weatherford and Fort Worth. The new line will co-operate closely with the Texas Motor Coaches, a bus line running between Fort Worth and Dallas, recently purchased from the Red Ball Company by R. E. Harding and other men of Fort Worth, in which Stone & Webster is also interested.

Bus Proposal Renewed in Miami

The Miami Beach Railway, Miami, Fla., will apply again for a bus system permit at Miami Beach, revising the schedule for which City Manager C. A. Renshaw refused a permit because the plan was considered inadequate and curtailed the service started a month ago.

The only other permit application filed, as required by the city ordinance passed a month ago, is that of the Intercity Transportation Company, composed of 29 jitney drivers. This application has not been acted upon by the city. Officials of the jitney corporation say they have leased a terminal lot at South Beach, from which they will operate the intercity lines if the city refuses a permit. Their application offers a ten-minute schedule from Miami to South Beach and twelve-minute service from Miami to North Beach.

Peru Saved from Unwarranted Competition

The death knell of intracity buses in Peru, Ind., in so far as their operation in competition with street cars is concerned, was sounded recently when the City Council voted to instruct the ordinance committee to draft a new bus ordinance under which buses will be required to operate only on streets where there are no street car lines. Previous to the vote a resolution from the Peru Chamber of Commerce recommending that such an ordinance be passed was

Hearing on Purchase of Peoples Coach at Indianapolis

A hearing was held recently in Circuit Court in Indianapolis, Ind., on a petition of the Indianapolis Street Railway for approval of the purchase by that company of the Peoples Motor Coach Company for \$500,000. The court's decision will be announced later.

The hearing was an appeal from a ruling of the Indiana Public Service Commission, which denied the petition last spring and is the first appeal taken under an act passed by the 1927 Legislature, which provides for procedure of this nature. The city legal department offered no opposition to the purchase, the corporation counsel claiming that city officials feel there should be only one transportation company in operation.

Attorneys for the local electric railway informed the court that the petition should be granted, as it would permit improvement in service and argued that the purchase price was not unreasonable.

Arthur L. Gilliom, Attorney-General, did not appear in court to represent the Public Service Commission. He ex-

plained that the law under which the appeal was taken did not make the Public Service Commission a party to the petition. Should the Circuit Court judge reverse the ruling of the Public Service Commission, he would notify the commission and give the commissioners an opportunity to change the ruling. If the commission refuses to alter its ruling, the court then has power to grant the appeal and authorize the transaction.

Bus Permit Between Danville and Springfield Sought

The Illinois Power & Light Corporation has applied to the Illinois Commerce Commission for permission to operate buses between Danville and Springfield, Ill. Harry Payne, general division superintendent of the corporation, indicated that establishment of the bus service would probably mean greater co-ordination of motor vehicles with interurban carriers.

Buses on Lakewood Line in Jamestown

A declaration of abandonment of the Lakewood line of the Jamestown Street Railway, Jamestown, N. Y., operating between Jamestown and Lakewood, N. Y., was approved by the Public Service Commission on Oct. 6. At the same time a certificate of convenience and necessity was granted for the operation of a bus line by the Jamestown Motor Bus Transportation Company, a subsidiary, to provide service in the territories to be abandoned by the railway. The abandoning of the railway will do away with a grade crossing of the Erie Railroad tracks, the bus company planning so to operate its line that the railroad will not be crossed.

Evidence presented at the hearing showed that the company would not be justified in trying to finance the work needed to be done to rehabilitate the railway. There was no opposition to the railway abandonment provided bus service was arranged.

Sea Side Bus Line Passes to Railway

After prescribing certain conditions as to the transfer of an indebtedness, the Board of Public Utility Commissioners of New Jersey on Oct. 8 approved the sale of the property, franchises and equipment of the Atlantic Coast Transportation Company to the Coast Cities Railway. The trolley line extends from North Long Branch through various municipalities to Sea Girt. The transportation company operates a bus line through the same general territory, but skirting the ocean closely, extending, however, south to Manasquan and in addition serves the outlying territory west of the general route of the main line. Both properties have been under the same financial control.

Financial and Corporate

Increase in Illinois Business

The Chicago & Joliet Electric Railway, operating cars and buses, carried 2,171,740 passengers and the Illinois Traction System 226,764 passengers through the Joliet, Ill., terminal in the summer season of June, July and August. More than half the Chicago & Joliet total represents city service traffic in Joliet, while nearly 400,000 others rode the buses. The establishment of a connecting link in Joliet between downtown centers and Chicago was responsible for the great increase in business, officials explained.

Bondholders Buy Boston & Worcester

An offer of \$360,000 for all the property of the Boston & Worcester Street Railway was submitted at the foreclosure sale at Framingham, Mass., on Oct. 11 by Henry D. Rising of Boston, representing the bondholders' protective committee. The sale was conducted by Franklin P. Miller, receiver, and Mr. Rising's bid was the only one received. The sale is subject to confirmation by the Supreme Court at Boston. If it is confirmed the bondholders' committee plans to take possession of the property early in November and continue operations.

Offer Made to Winnipeg Stockholders

Stockholders of the Winnipeg Electric Company, Winnipeg, Man., will be offered rights to subscribe to 40,000 shares of additional common stock at \$60 a share, on the basis of four new shares for each eleven held, on Oct. 15. Manitoba Power Company, Ltd., controlled by the Winnipeg Electric Company, is expected to double its common stock of 200,000 shares at a stockholders' meeting on Nov. 10. The company intends to issue 50,000 shares of this stock to shareholders at \$60 a share in the ratio of one share for each two held.

A. W. McLimont, president of the Winnipeg Electric Company, stated that earnings of the Manitoba Power Company, Ltd., have reached the point where a dividend is warranted and it is the intention of the directors to declare it.

Sale Date Set for New Jersey Property

Charles F. Lynch, special master appointed by the United States District Court, will sell the holdings of the Morris County Traction Company at public sale on Oct. 31. The sale will be held at Morristown and is on a bill of foreclosure brought by the People's Savings & Trust Company, Pittsburgh, Pa.

The sale will comprise auto buses, the franchise, real estate and interests in land held by the company in Morris County. The company has 43.60 miles of track, 47 trolley cars, nine buses, snow plows, flat cars and tools. In all there are 122 tracts of land, in Union and Morris Counties.

Abandonment on Joplin City Line Sought

The Southwest Missouri Railroad at Webb City, Mo., has applied for permission to take up its city service lines in Joplin, Mo., and discontinue service other than on the main line. Officials are seeking discontinuance state that these lines are being operated at a loss. The railroad is now under a receivership. The city of Joplin will oppose the abandonment.

Smallest New York Car Line Would Quit

The shortest car line in New York City, namely, the Van Brunt Street & Erie Basin Railway, operating about a mile of track from Hamilton Ferry to Erie Basin, Brooklyn, has asked Justice Carswell in Supreme Court Brooklyn, to appoint a receiver so that the railway can file a petition of voluntary dissolution and go out of existence. The company is faced with financial difficulties and refers to serious debt in the nature of a judgment of \$10,040 obtained for personal injuries inflicted by one of the company's cars. Besides this, on a revenue of \$140 a day, the company has been running up annual deficits for some time past.

Junior Security Holders Sue Chicago Railways Receivers

The suit of the trustees of junior securities of the Chicago Railway, Chicago, Ill., to compel receivers of the property to pay interest on the \$37,866,000 of A and B consolidated mortgage and purchase money bonds was taken under advisement recently by Federal Judge James H. Wilkerson. Funds sufficient to pay the interest at 5 percent from Feb. 1, the date the company's twenty-year franchise expired, to Aug. 1 of this year has been set aside by the receivers on the order issued by Judge Wilkerson early last summer, but no interest has yet been paid for the period.

Attorneys for the junior security holders in their petition contend that their bonds were considered in the ordinance of 1907 as special funds and as such should receive interest payment before or at the same time that interest is paid on the first mortgage bonds.

The suit of the junior security holders

is being opposed by the Harris Trust & Savings Bank, Chicago, trustee for the first mortgage bondholder, on the ground that first mortgage bonds are prior liens over all other outstanding securities of the company.

One-Mile Line in Pennsylvania Quits

The Huntington, Lewiston & Juniata Valley Traction Company, Huntington, Pa., abandoned service on Oct. 4. High cost of operation was given as the reason for the suspension. It was said that the cars were worn out and the company could not afford to replace them. The line is only 1 mile long.

A Michigan Interurban to Abandon Service

The combined efforts of the Benton Harbor & St. Joseph Railway & Light Company, Benton Harbor, Mich., the Benton Harbor Chamber of Commerce and civic organizations in communities served by the railway to revive patronage have met with little success. Officials of the railway recently announced that freight and passenger service would be abandoned on the interurban lines running between Benton Harbor and Watervliet and between Benton Harbor and Dowagiac. Approximately 40 miles of single track is affected. No definite date was given for the discontinuance of service, but the first step toward actual abandonment was taken when notices were posted of the cancellation of existing rate schedules on Oct. 30. H. W. Wallsmith, general manager of

the railway, remarked that the decision of the railway to cease operation of its interurban lines marked the end of an unsuccessful struggle against changed conditions brought about by the increasing use of trucks for short hauls and the growth of the automobile and bus as factors in passenger transportation. The company will continue to operate the local lines in Benton Harbor and St. Joseph.

8,463,338 Passengers Traveled in Westchester

Nearly 8,500,000 people traveled on the New York, Westchester & Boston Railway lines in Westchester, N. Y., during the first eight months of the current year, according to a traffic report made public recently by Leverett S. Miller, president. Daily travel on both eastern and western divisions has reached the record average of approximately 36,000 daily. The total of 7,561,310 registered during the first eight months of 1926 has been boosted during a similar period in 1927 11.94 per cent to a new record of 8,463,338. The month of August also set a new record, 1,073,347 passengers having been carried, which was a gain of 103,434 compared with August, 1926, which itself was a record-breaker. Passengers at the recently opened terminal at Harrison numbered 53,978 during August.

\$581,700 Balance in Detroit

The city of Detroit, Department of Street Railways, income and statistical statements for the year ended Dec. 31, 1926, are as shown in the table below.

Approves Abandonment of Two New York Lines

A declaration of abandonment by the Hudson Valley Railway, Glens Falls, N. Y., of its Lake George-Warrensburg lines and its Greenwich-Thompson Lines received approval of the Public Service Commission on Aug. 29, following a rehearing given by the commission on its order dated March 3, 1927. At that time it denied approval of the company's petition to abandon these two lines. The amendment does not become effective until Jan. 1, 1928, and in the interim the commission will make a survey of the transportation facilities along and contiguous to the Hudson Valley Railway's entire line and then call a conference of representatives of the railway line and other public carriers, including bus lines, and representatives of municipalities to discuss and devise means of public transportation where unprofitable branches are abandoned by the railway. The order approving the proposed abandonment was based on a memorandum by Chairman Prendergast which was concurred in by Commissioners Pooley, VanNamee and Brewster. Commissioner Lunn voted against the proposal.

It was shown in the evidence that the Hudson Valley Company in 1926 sustained an operating deficit of \$64,758 and, based on a complete analysis of the evidence and exhibits and actual experience, an operating loss of \$5,974 was indicated for the Greenwich line and \$13,492 for the Warrensburg line. These deficits take into consideration revenue from sales of power which, if excluded, would increase the deficits on the two branch lines to \$11,245 and \$13,618.

INCOME STATEMENT, DEPARTMENT OF STREET RAILWAYS, CITY OF DETROIT

	—Year Ended Dec. 31—	
	1926	1925
Income		
Operating Revenue:		
Railway operating revenue.....	\$22,580,243	\$22,413,689
Coach operating revenue.....	2,157,818	818,328
Total operating revenue.....	\$24,738,061	\$23,232,017
Non-operating income.....	268,528	184,273
Total revenue from all sources.....	\$25,006,590	\$23,416,291
Operating Expenses:		
Railway operating expenses.....	\$17,055,022	\$16,572,497
Coach operating expenses.....	2,083,942	786,557
Total operating expenses.....	\$19,138,965	\$17,359,055
Net revenue from all sources.....	\$ 5,867,624	\$ 6,057,235
Deduct:		
Taxes assignable to operation.....	\$724,569	\$705,615
Other deductions.....		935
Interest on funded debt:		
On purchase bonds.....	149,728	155,380
On construction bonds.....	785,875	785,875
On additions and betterments bonds.....	230,860	137,305
On purchase contract (D. U. R.).....	794,663	854,662
Total interest.....	\$1,961,126	\$1,933,224
Total deductions.....	\$2,685,696	\$2,639,774
Net income.....	\$3,181,928	\$3,417,461
Disposition of Net Income:		
Sinking Funds:		
For purchase bonds.....	\$133,000	\$133,000
For construction bonds.....	519,709	571,351
For additions and betterments bonds.....	160,000	358,798
For purchase contract (D. U. R.).....	1,787,518	1,787,518
Total sinking funds.....	\$2,600,227	\$2,850,667
Balance for the period.....	\$581,700	\$566,793

STATISTICAL STATEMENT, DEPARTMENT OF STREET RAILWAYS, CITY OF DETROIT

	—Year Ended Dec. 31—	
	1926	1925
Railway revenue car-miles.....	53,109,845	52,863,111
Coach revenue coach-miles.....	8,977,267	3,529,795
Railway revenue car-hours.....	5,497,640	5,692,190
Coach revenue coach-hours.....	895,112	354,153
Railway revenue passengers.....	359,475,040	357,926,168
Railway transfer passengers.....	125,763,285	123,310,526
Railway total passengers.....	485,238,325	481,236,694
Coach revenue passengers.....	25,314,545	10,564,723
Coach transfer passengers.....	2,095,715	387,228
Coach total passengers.....	27,410,260	10,951,951
Total revenue and transfer passengers.....	512,648,585	492,188,645
Railway operating revenue per car-mile, cents.....	42.52	42.40
Coach operating revenue per coach-mile, cents.....	24.04	23.18
Railway operating expenses per car-mile, cents.....	32.11	31.35
Coach operating expenses per coach-mile, cents.....	23.21	22.28
Railway operating revenue per car-hour.....	\$4.11	\$3.94
Coach operating revenue per coach-hour.....	\$2.41	\$2.31
Railway operating expenses per car-hour.....	\$3.10	\$2.91
Coach operating expenses per coach-hour.....	\$2.33	\$2.22
Ratio of transfer passengers to revenue passengers—railway, per cent.....	34.99	34.45
Ratio of transfer passengers to revenue passengers—coach, per cent.....	8.28	3.66
Railway revenue passengers per car-mile operated.....	6.77	6.77
Railway transfer passengers per car-mile operated.....	2.37	2.33
Total railway passengers per car-mile operated.....	9.14	9.10
Coach revenue passengers per coach-mile operated.....	2.82	2.99
Coach transfer passengers per coach-mile operated.....	.23	.11
Total coach passengers per coach-mile operated.....	3.05	3.10
Ratio of railway operating expenses to railway operating revenue, per cent.....	75.53	73.94
Ratio of coach operating expenses to coach operating revenue, per cent.....	96.58	96.12

Industries Expanding in Beaver Valley Territory

While gross receipts of the Beaver Valley Traction Lines, New Brighton, Pa., were less in 1926 than in 1925, the decrease is due principally to the loss of business incident to bridge reconstruction. However, certain charges assumed by a neighboring company brought net revenues to about the same as in the preceding year. This was the explanation contained in the annual report of the Philadelphia Company, the parent concern. The net deficit for the year was \$8,044.

STATISTICS OF BEAVER VALLEY MOTOR COACH COMPANY

Routes operated.....	
Route miles operated (single way).....	10.1
Coaches owned.....	16
Revenue coach miles operated†.....	352,109
Passengers carried.....	1,084,811
Passenger revenue per revenue coach mile (cents)†.....	29.28
Average fare per passenger (cents).....	9.16

† Includes special coach miles.

† Includes special coach revenue and mileage.

SUMMARY OF INCOME AND PROFIT AND LOSS OF THE BEAVER VALLEY MOTOR COACH COMPANY FOR THE YEAR ENDED DEC. 31, 1926

Operating revenues.....	\$108,861
Operating expenses:	
Maintenance of equipment.....	\$12,508
Traffic.....	584
Transportation.....	54,354
General administrative.....	5,380
Other general.....	8,611
Taxes.....	5,184
Total.....	86,623
Net revenue from operations.....	\$22,237
Income charge—Interest on unfunded debt.....	3,860
Net income before appropriation..	\$18,377
Appropriation for depreciation....	23,031
Deficit for the year.....	\$4,654
Deficit, Jan. 1, 1926.....	\$7,484
Deficit credits—Miscellaneous (net).....	4,526
Total.....	2,958
Deficit, Dec. 31, 1926—Per balance sheet.....	\$7,613

The Beaver Valley is a rapidly growing industrial section, owing its advance to the development of diversified industries; and as the electric railway serves the territory for an expanse of 20 miles, the prospects appear to be improving. Established industries are expanding and the communities in the valley are growing at a rate scarcely exceeded in any other part of the Pittsburgh district. With the completion of many of the highway improvements in 1927, it is expected that restored communications will favorably affect the revenues during the year.

In November, fourteen employees had completed a 25-year record of continuous service and were awarded engraved watch charms. A twenty-year club has been organized.

The Beaver Valley Motor Coach Company's revenue of \$108,861 increased 25 per cent over the previous year, due largely to the change in service at Leetsdale from street cars to coaches, and also to temporary conditions. Operating expenses, excluding

SUMMARY OF CONSOLIDATED INCOME AND PROFIT AND LOSS FOR YEAR ENDED DEC. 31, 1926, BEAVER VALLEY TRACTION COMPANY AND PITTSBURGH AND BEAVER STREET RAILWAY

Gross revenue from street railway operations.....	\$597,038
Operating Expenses:	
Maintenance of way and structures.....	\$66,794
Maintenance of equipment.....	34,330
Traffic.....	8,622
Power.....	70,343
Transportation.....	134,206
General administrative.....	57,607
Other general.....	48,969
Taxes.....	14,964
Total.....	435,839
Net revenue from street railway operations.....	\$161,199
Auxiliary Operations:	
Operating revenues.....	\$5,533
Operating expenses.....	6,112
Net loss from auxiliary operations.....	578
Net revenue from operations.....	\$160,621
Non-operating revenues:	
Rental of real estate and buildings.....	\$887
Interest from investment securities.....	385
Interest from other sources.....	100
Miscellaneous.....	4,862
Total.....	\$6,235
Non-operating expenses.....	551
Net revenue from other operations.....	5,683
Gross income.....	\$166,305
Income charges:	
Rent of leased properties.....	\$4,475
Interest on funded debt.....	119,100
Interest on unfunded debt.....	36,032
Total.....	159,597
Net income before appropriations..	\$6,707
Appropriations:	
Depreciation.....	\$13,448
Amortization of debt discount and expense.....	1,304
Total.....	14,752
Net deficit for the year.....	\$8,044
Deficit, Jan. 1, 1926.....	482,298
Miscellaneous debits (net).....	33,378
Deficit, Dec. 31, 1926—Per balance sheet.....	\$523,721

depreciation, for which a relatively large sum was reserved, increased \$4,102 and although there was a sharp rise in taxes, net earnings from operations amounting to \$22,237 increased \$17,886 over 1925.

With the completion of the rebuilding program affecting bridges and streets and the resumption of normal operating schedules, it is expected that the system of motor coach lines in the Beaver Valley will become a factor of importance in the transportation facilities of that section. The lines are primarily intended to serve as auxiliaries to the electric railway lines and the service is co-ordinate.

STATISTICS OF THE BEAVER VALLEY TRACTION COMPANY AND PITTSBURGH & BEAVER STREET RAILWAY

Miles of road.....	25.30
Miles of track.....	42.06
Cars { Passenger.....	38
Miscellaneous.....	7
Total cars.....	45
Car miles operated.....	1,573,527
Passengers carried { Revenue.....	11,429,625
Transfer.....	555,371
Total passengers carried†.....	11,984,996
Passenger revenue per (revenue) car-mile—cents.....	37.53
Passenger revenue per total passenger carried—cents.....	4.92

† Excluding free passengers.

Lincoln Depreciation Allowance Reduced

The Nebraska Railway Commission has reduced the amount of maintenance and depreciation which the Lincoln Traction Company, Lincoln, has been compelled to set up on its books in recognition of the fact that abandonment of car lines has greatly reduced the investment in physical property and the cost of repair and replacement. Buses have been substituted in each case where a car line has been eliminated and the set-up required for them is much less. The company is still suffering a loss of about \$1,000 a month in revenues compared with a year ago, but the increase in the number of buses has been materially reducing the figure. Managing officials say that the smaller set-up for depreciation will enable the company to add enough to its net revenues to take care of its bond interest this year.

Colorado Property Valued

The Grand River Valley Railroad, electric line, operating between Grand Junction and Fruita, Col., was given a tentative value on Sept. 12 of \$260,250 by the Interstate Commerce Commission. This figure is of June 30, 1919.

Car Line Bought by San Francisco Business Men

Merchants of Montgomery Street sent a check for \$18,000 to the Market Street Railway, San Francisco, Cal., for the car line on that street. It was the final gesture in the long campaign to remove the car tracks from Montgomery Street so as to make way for the needs of modern traffic. This is in line with the purpose of the organization to make Montgomery Street a financial stronghold of the Pacific Coast.

Claims Hold Up Ratification of Binghamton Sale

Claims of the city of Binghamton N. Y., against the Binghamton Railway for more than \$200,000 for paving work will have to be settled before the sale of the company is ratified by the court. This was the advice given Corporation Counsel John J. Irving by the United States Court in Albany.

Assistant Corporation Counsel Ra represented the city in the court fight to have these claims made a prior lien over the first mortgages, and claim amounting to \$182,599 were included in the report of Special Master George E. Lyon. There is now included in this preferred list an estimate of \$43,000 for paving. The railway claims an offset to a part of these charges on account of expense in connection with change in track to accommodate sewer laying. The court holds the claims must either be paid by the railway before the property is sold or else the property must be sold subject to these claims, which precede mortgages or other liens.

Readjustment Plan for West Chester Property

A plan and agreement for the readjustment of securities of the West Chester Street Railway, West Chester, Pa., and which provides for the exchange of new securities for old securities without the payment of any cash on the part of the security holders has been adopted by a committee. The plan involves the company's first mortgage 5 per cent gold bonds, due Aug. 1, 1932; first lien and collateral trust sinking bond gold bonds, series A, 6 per cent, due Oct. 1, 1939; 7 per cent participating cumulative preferred capital stock, common capital stock and secured promissory notes.

An invitation has been extended by the committee to all holders to deposit their securities at an early date. O. Howard Wolfe, cashier Philadelphia Girard National Bank, is chairman of the committee. The company has total assets of approximately \$3,000,000.

Payment Period Extension in Seattle in Hands of Committee

By a vote of five to four, the City Council of Seattle, Wash., recently adopted Councilman A. Lou Cohen's resolution for appointment of a committee of three to negotiate with representatives of the Puget Sound Power & Light Company, the Old Colony Trust Company of Boston and the Boston Safe Deposit Company with the intention of taking a hand in the negotiations with Stone & Webster interests for an extension in the payment period for the remaining \$10,000,000 of the \$15,000,000 purchase price of the Seattle Municipal Railway. The committee appointed by Council President John E. Carroll are A. Lou Cohen, Oliver T. Erickson and E. L. Blaine. This committee will act in conjunction with Mayor Bertha K. Landes, who has been conferring with A. W. Leonard, president of the Puget Sound company.

Electric Bond & Share Acquires South American Properties

The acquisition of utilities in Brazil, Colombia, France, Japan and other foreign countries by the Electric Bond & Share Company, New York, N. Y., costing \$36,417,597, was announced on Oct. 3, and a proposal of their transfer to the American and Foreign Power Company, Inc., a subsidiary. The cost includes annual interest at 6 per cent from date of expenditure to Oct. 1 and \$350,000 in overhead expenses. Shareholders of the subsidiary will vote on the proposed transfer at their annual meeting in Augusta, Me., on Oct. 18.

Brazilian acquisitions of the Electric Bond & Share include railway companies in Petropolis, Bahia and Victoria. The new acquisitions of the Electric Bond & Share Company have been vested with the South American Power Company, a Florida corporation.

Book Reviews

Your Money's Worth

By Stuart Chase and F. J. Schlink. New York, N. Y.: Macmillan Company. 286 pages. Price, \$2.

"What fools these mortals be" can be applied to the majority of consumers who spend a dollar and receive 25 cents worth. The American's gullibility for advertising misrepresentation, label mysteries, short weights and measures and his complacency and lethargy in wiping out quackery in general have been made the subject of serious study by these two explorers of hokum. Their findings are offered very frankly in "Your Money's Worth." Many things have been debunked within the past few years, but the reader in this instance will be more amenable to the indictments as he will not feel that the authors have an axe to grind or a product to sell. Rather do the authors point the way out of this wonderland of advertising mystery and illusory products to a terra firma of frank if less colorful sales propaganda where the trial and error method, so futile and so costly, is unknown.

Against this widespread adulteration and fraud there is little in the way of protection for products other than food and drugs. In cement and certain electrical equipment voluntary standards have been nationally accepted. Certain transportation equipment, especially in motor car parts and materials, must conform to standards, including those of safety. Simplification has been a first aid in the buyer's buying.

In paving brick alone, a commodity used very generally in the railway business, the variety has been reduced from 66 to four, with an annual estimated saving of \$1,000,000.

Buying from specification, however, to aid the consumer needs more co-ordination and more direct release of information. There are governmental outposts, such as the Federal Trade Commission, Bureau of Standards and the United States Navy, where laboratories are in operation as well as private outposts such as the General Electric, the Westinghouse and the United States Steel, which operate with splendidly equipped research facilities, but it is the intermediate consumer who is benefiting and not the ultimate consumer to any great degree.

A cure for this unhealthy economic condition can be found, according to Messrs. Chase and Schlink, in a definite interest on the part of the community toward organized pressure to get money's worth. Besides asking advertisers to produce scientific facts upon which their claims are based, they offer about 50 suggestions to the man about to buy. If only science could displace magic in salesmanship the authors believe that the whole curve of consumption would change.

This book is a "plea for a genuine science of buying and consuming." Against H. L. Mencken's theory that the average citizen is desolute without his daily dose of bunkum, the authors say that a greater man than he "founded his life on the principle that you 'cannot fool all the people all of the time.'"

Business Without a Buyer—

By William Trufant Foster and Waddill Catchings, Pollak Foundation for Economic Research. New York, N. Y.: Houghton Mifflin Company. 205 pages. Price, \$2.

A pleasant and profitable evening is offered the American business and industrial man through "Business Without a Buyer," a theory for the smoothing out of the business cycle expressed in the language of the layman. Why, with all this progress of increased wages, high technical attainments and better living conditions, has this "cycle of business" not been smoothed out and "depression" and "prosperity" softened into "good times" and "better times"?

The authors answer this question with a theory based upon five facts: First, our vast production resources are not used at any approach to capacity; second, we do not produce at capacity because we fear we cannot sell the goods at prices which will make continued production possible; third, we cannot sell the goods because the consumer does not have a sufficient income; fourth, the consumer does not have sufficient income to buy because the manufacturing processes do not allow a money profit sufficient for the consumer to buy the goods, and the people, under the impelling necessity of saving, cannot spend even as much money as they receive, and, fifth, since business can be prosperous only when there are buyers, and since our present system limits both the number of buyers and their capacity to purchase goods, then the solution of the problem lies in an adequate income to the consumer, which in addition to what he may save will allow him to buy all the finished products as rapidly as they are put on sale. Here are points on the possible solution of America's economic problems.

Electrification of Sydney and Suburban Railways

Reprint of the Institution of Engineers, Australia, Transactions, Vol. VII, 1926. 382 pages.

This is a series of papers presented before the Institution of Engineers, Australia, at Sydney, August to December, 1926, with maps, illustrations, drawings and index. Among the subjects discussed are signaling system, power supply and distribution and track and construction work.

Personal Items

F. A. Klock Controls Coach Operation

Fred A. Klock, formerly superintendent of motor coach operations of the Chicago, North Shore & Milwaukee Railroad, Highwood, Ill., has been appointed general manager of the North Shore Line's motor coach division. Reorganization of the motor coach department as a division attended the promotion. Simultaneously, Mr. Klock was also appointed general manager of the following associated motor coach companies under the management of Samuel Insull and associates: Metropolitan Motor Coach Company, Chicago-Milwaukee; Western Motor Coach Company, Chicago-Rockford, Ill.; Northwestern Transit Company, local service in Oak Park, Ill., and vicinity, and Northern Illinois Service Company, Chicago-Dixon, Ill.-Clinton, Iowa-Davenport, Iowa. Mr. Klock now has charge of the operation and maintenance of the entire group of motor coach companies. His office is located in the Commonwealth Edison Building, Chicago.

M. M. Herrell Traffic Agent at Logansport

The Indiana Service Corporation has announced the appointment of M. M. Herrell as traffic agent with headquarters at Logansport, Ind. Mr. Herrell will represent the traffic department in the freight and passenger business in Peru, Logansport, Delphi, Lafayette and intermediate points.

C. C. Gillette Resigns at Wheeling

C. C. Gillette, general manager of the Wheeling Public Service Company, Wheeling, W. Va., since June, 1926, has resigned. No announcement has been made on any new assignment Mr. Gillette will pursue. Rumor has it that his successor will be H. H. Patterson of Philadelphia.

During Mr. Gillette's two years administration in Wheeling many improvements have been made. New cars were put in operation during the period and considerable paving work accomplished or under way. As general manager in Wheeling he succeeded J. K. Buchanan.

Prior to his affiliation at Wheeling Mr. Gillette served as special investigator and then as traffic agent of the Pittsburgh Railways, Pittsburgh, Pa. On Oct. 1, 1925, he became research manager, succeeding A. C. Spurr. In the course of his five years with the Pittsburgh property he held a number of other executive positions, these embracing practically every phase of railway endeavor. The research department

especially entered the entire field of electric transportation dealing with the quantity and quality of railway service and especially public relations.

Mr. Gillette gained his first engineering experience with the American Expeditionary Forces in France. After he was graduated from Bucknell Univer-

sity with the degree of electrical engineer he joined the service and came out of the Meuse-Argonne offensive a captain. Immediately after the war he joined the engineering staff of the Westinghouse Electric & Manufacturing Company, engaging entirely in the railways project section. He was there two years and from there went to the Pittsburgh Railways.

Mr. Gillette was born in Rochester, N. Y., in 1895. He is a member of the American Legion and the Veterans of Foreign wars.

W. H. Sawyer Heads Stevens & Wood

Former East St. Louis executive and past-president of A.E.R.A. joins engineering firm as president with jurisdiction over its engineering, appraisal and report work

W. H. SAWYER has purchased a financial interest in Stevens & Wood, Inc., New York, and has joined that organization as president, succeeding in that position R. P. Stevens, who



W. H. Sawyer

part of this work, including, as it does appraisals and reports, is for outside interests with which Stevens & Wood have no financial connection. Particularly in this field is Mr. Sawyer's long service as an engineer, operator and executive of wide experience expected to add materially to the effectiveness of the Stevens & Wood organization.

As president of the American Electric Railway Association during the past year Mr. Sawyer has given unselfishly of his time toward promoting the interests and the development of the industry. He has traveled extensively, has visited many properties and has appeared on the program of various sectional associations in his effort to impress upon the industry a clear conception of the requirements for meeting present-day transportation demand. He is a firm believer in the possibilities of the bus in the development of public transportation service, but insists that destructive competition and exaggerated claims for the advantages of the bus handicap rather than further its development. He has been an ardent advocate of the need for improving the street car to meet present-day conditions, and devoted himself tirelessly to the task of insuring an adequate car exhibit at the recent convention in Cleveland.

After his graduation from the University of Nebraska the new president of Stevens & Wood, Inc., had a diversified and an important nine years experience with the General Electric Company. He then became engineer in charge of the New York office of Ford, Bacon & Davis, where he served for another nine years.

In 1914 Mr. Sawyer was elected vice-president of the E. W. Clark & Company Management Corporation, where he had further management, engineering and construction experience. This experience was further widened by his connection with the North American Company, as president of the East St. Louis & Suburban Railway and affiliated properties, which connection Mr. Sawyer leaves to join Stevens & Wood.

A great compliment was paid to his

as chairman of the board and executive committee will be enabled to concentrate on the financial and public utility phases of the business. He will assume his new duties in the near future and will devote his time principally to the business-engineering management of the Stevens & Wood organization and the properties they control.

It is a post of much magnitude that Mr. Sawyer is assuming. Stevens & Wood, Inc., are identified with the operation of public utilities in eight states, with a combined value of more than \$150,000,000. These properties include the American Electric Power and the Penn-Ohio systems. The engineering and construction business of the firm now in progress includes work throughout most of the Eastern states and the territory of Alaska. A considerable

business and engineering ability when in 1925 Mr. Sawyer was retained by the Victorian Government of Australia and appointed a Royal Commissioner to inquire into and report upon the status and affairs of the Electricity Commission of Victoria, and especially as to its power generation and distribution. He obtained a leave of absence from the North American Company to undertake this work, which was accomplished with great success.

The business of Stevens & Wood, Inc., is increasing rapidly. Moreover, plans are underway by them for further expansion of their public utility interests, especially their consulting engineering, construction, appraisal and report business. This program has necessitated a material enlargement of their organization. The accession of Mr. Sawyer to the organization in connection with the corporation's expansion policy, bringing to bear as it will his keen mind, broad knowledge and experience, delightful personality and broad acquaintance in the public utility industry, should be of great value to that organization, particularly as he is a builder—a man careful in making decisions and fearless in carrying them out. He is an engineer-executive with keen appreciation of the value of good public relations. He has an enviable record in his management of men. He knows the utility industry and he knows the public.

A. G. MacKenzie Directs Pennsylvania Committee

A. G. MacKenzie has been appointed director of the Pennsylvania Public Service Information Committee, according to an announcement made recently by P. H. Gadsden, vice-president of the United Gas Improvement Company, who is chairman of the committee. Mr. MacKenzie succeeds Major J. S. S. Richardson, who has become director of information for the Joint Committee National Utility Associations.

Mr. MacKenzie has been associated with the Pennsylvania committee since October, 1925. He was formerly associated with Philadelphia newspapers in editorial and reportorial capacities. He has been acting director of the committee for the last five months.

H. W. Eales with Byllesby Engineering Corporation

H. W. Eales has been appointed head of the electrical engineering division, engineering department, of Byllesby Engineering & Management Corporation, New York. As a prominent engineer he accompanied W. H. Sawyer early in 1926 to Australia to assist in an investigation for the Victorian state government of the status and affairs of the State Electricity Commission.

He entered the General Electric Company test course at the West Lynn works in 1907, and in 1909 was trans-

ferred to its St. Louis office. In 1913 he became chief electrical engineer of the Union Electric Light & Power Company, St. Louis. This position he held until joining the Byllesby Engineering & Management Corporation.

Mr. Eales was born in Coventry, England. He came to the United States at an early age and received his education in this country, graduating with honors from Yale University in 1904.

E. J. Dickson Leaves Providence

Edgar J. Dickson, vice-president of the United Electric Railways, Providence, R. I., has resigned because of ill health.

Mr. Dickson went to Providence to assume the duties of vice-president on July 1, 1923, severing connection with the International Railway, Buffalo, after a service record of ten years as vice-president in charge of operation. He went with the Buffalo property in 1913, and when the Mitten Management took



E. J. Dickson

control in 1920 he was one of the few officials connected with the former administration who remained with the property.

As mentioned in the ELECTRIC RAILWAY JOURNAL, issue of April 7, 1923, he served through the most trying period in the company's history, aggravated by a strike of the trainmen in July, 1922. He stuck to his post until the emergency had passed, an act which was greatly appreciated by the company and which was commented upon at the time of his resignation when the management accepted it with reluctance and regret. The management was not alone in expressing such sentiments on his leaving the city of Buffalo. In the public press of the territory in which the International Railway operates, his standing in the community and his notable services in the industry were fulsomely praised.

Mr. Dickson started in the transportation industry in 1887 with the Chicago, Burlington & Quincy Railway at Galesburg, Ill. Later he served with the Northern Pacific Railway at St. Paul, Minn., and still later with the Lehigh

Valley Railway at South Bethlehem, Pa. Steadily advancing, he next became affiliated with the New England Investment & Security Company and then general manager of a group of four electric railways at Attleboro, Mass. Just prior to his connection with the International Railway he was general manager of the Springfield Street Railway, Springfield, Mass., one of the most important properties in the New England States.

Mr. Dickson was born at Joliet, Ill., in 1872.

As yet no successor has been named to Mr. Dickson. Temporarily, the transportation and traffic department of the United Electric Railways at Providence is being filled by Herbert B. Shaftoe, who is in charge of the financial and construction departments.

OBITUARY

H. R. Culley

Harry Randolph Culley, head of the freight department of the Augusta-Aiken Railway & Electric Corporation, Augusta, Ga., died recently in Augusta. Mr. Culley went with the company in 1920, when Mr. Banghart was general manager. With him he brought a record of service in the transportation field, both in the navigation and steam railway fields. On account of his familiarity with the details of steam freight service, Mr. Banghart placed him in charge of that branch, which had been operating at a loss. To his efforts the revival of the freight business in that locality has been attributed.

Mr. Culley was born in Suffolk, Va., in 1859. He was educated in the public schools of that city and at the Boys Military Academy, Nansemond County, Va. His son, F. B. Culley, is general manager of the company at Augusta.

RALPH A. GILL former superintendent of railways for the Eastern Texas Electric Company, Beaumont, Tex., died recently at Holredge, Neb., where he was transferred about two years ago. He went to Beaumont from El Paso, where he was assistant to the superintendent of the El Paso Electric Company.

A. K. PLUMMER, long affiliated with the Los Angeles Railway, Los Angeles, Cal., died recently. He entered the service as a motorman on Aug. 27, 1903, and continued in that capacity until Nov. 1, 1906, when he was appointed extra inspector and regular inspector a year or two later. He was transferred to the instruction department on Sept. 8, 1917. A few years later he was appointed director of traffic. When failing health compelled his transfer to less arduous duties on Oct. 1, 1923, he was placed in charge of the signing up and dispatching of cars from the various divisions and succeeded in improving conditions materially.

Manufactures and the Markets

Work on Twelve Macon Cars Progresses

The twelve new cars being built by the Perley A. Thomas Car Company for the Macon Light & Railway Company are scheduled for delivery in November. The cars, which are of the one-man, double-end, double-truck type, have an over-all length of 41 ft. 8 in. and a seating capacity of 40. The exterior color scheme is of green and cream, while the interior trim is of cherry.

Specifications covering the cars are appended here:

Number of units.....	12
Type of unit.....	One-man, motor, passenger, city, double end, double truck
Number of seats.....	40
Builder of car body.....	Perley A. Thomas Car Co., High Point, N. C.
Date of order.....	June, 1927
Date of delivery.....	November
Length over all.....	41 ft. 8 in.
Length over body posts.....	28 ft. 6 in.
Truck wheelbase.....	5 ft. 4 in.
Width over all.....	8 ft. 4 1/2 in.
Height, rail to trolley base.....	11 ft. 3 in.
Window post spacing.....	29 1/2 in.
Body.....	All steel
Roof.....	Arch
Doors.....	End
Air brakes.....	Safety Car Devices
Armature bearings.....	Plain
Axles.....	A.E.R.A. E-2 Phys. prop. E-5-24
Car signal system.....	Paradise
Compressors.....	Westinghouse DH-16
Conduit.....	Flexible
Control.....	K-35-KK
Curtain fixtures.....	Curtain Supply Co., Rex roller No. 90 fixtures
Curtain material.....	Pantasote, double grain color 86
Destination signs.....	Keystone ILR and RLR
Door mechanism.....	National Pneumatic or Consolidated
Doors.....	Sliding
Floor covering.....	Rubber tile
Gears and pinions.....	G.E., long and short addendum
Glass.....	Plate and D.S.A.
Hand brakes.....	Peacock staffers
Hand straps.....	Rico retrieving
Heaters.....	C.C.H. Co. with G.E. helicoil elements
Headlights.....	G.E. J-34
Headlining.....	Haskelite
Interior trim.....	Natural cherry
Journal bearings.....	Plain
Journal boxes.....	Taylor
Lamp fixtures.....	Keystone center dome
Motors.....	Four G.E.-264, inside hung
Painting scheme.....	Green and cream
Registers.....	Ohmer
Roof material.....	7/8-in. poplar
Safety car devices.....	Standard
Sash fixtures.....	Curtain Supply Co., brass sash
Seats.....	Hale & Kilburn AWO 400 walkover
Seat spacing.....	29 1/2 in.
Seating material.....	Canvas lined cane inerts
Slack adjusters.....	American, Form E-1
Steps.....	Stationary
Step treads.....	Kass
Trolley catchers.....	Ohio Brass No. 13141
Trolley base.....	Ohio Brass Form 4, Timken bearing
Trolley wheels.....	Nuttall 4-in.
Trucks.....	Taylor, type M
Ventilators.....	Nichols-Lintern, type C
Wheels.....	26-in. cast chilled
Wheelguards.....	HB type
Special devices.....	Treadle doors with power and brake interlock and signal lights

Ten Units Ordered for Milwaukee

The Milwaukee Electric Railway & Light Company, Milwaukee, Wis., has ordered ten one-man cars at a cost of \$14,000 each. Delivery is expected from the St. Louis Car Company, builders, on Dec. 1 this year. Except for several minor improvements, the new units will be identical with the 50 new one-man safety cars purchased last winter. The contemplated changes in-

clude improved design of the movable platform seats, further improvement in location of compressed air pipes and probably the installation of a permanent operator's seat on each platform.

Patent is a Monopoly, Says Report of N.E.M.A. Committee

Although asking for more time in which to continue further study, the committee on cross-licensing of patents, National Electric Manufacturers' Association, has agreed on the following principles which were presented to the policies division of the association at its meeting during the first week of September:

A patent is a monopoly granted to an inventor or his assignee for a term of seventeen years. It is designed and intended to be a monopoly, the important objects of which are to stimulate the making of inventions and to justify the expenditure of money in the development and working out of inventions after they are made.

Any policy of cross-licensing must, in our opinion, be based upon the fundamental consideration that a patent is, and fundamentally should be, a monopoly, and that the holder of any lawful monopoly is entitled to decide for himself the manner in which he will use it.

Any licensing plan must, therefore, be acceptable not only to those parties who have no patents (or no important patents), but also to whatever parties may happen to have patents regarded by them as important.

We all recognize that in the case of an individual grant of a license under a patent, if the royalty is too high the return from the royalty will be likely to be small, whereas, on the other hand, if the royalty is too low the return will necessarily be unduly small.

Your committee also recognizes that it is often undesirable and unwise to grant too many licenses under any particular patent or group of patents, since it often happens that it is only by limiting the number of licensees that it is possible to obtain sufficient interest on the part of a group of manufacturers properly organized and equipped to undertake the manufacturing and distribution of the patented device. Such restriction of the number of licensees often aids, both directly or indirectly, in maintaining the quality of the article and the service to the public.

Your committee believes it advisable also to make it clear that no cross-licensing arrangement involving all the patents of the electrical industry has been, or should be, considered practicable. The extreme diversity of the electrical industry makes it fall naturally in certain groups. In some of these groups the bulk of the valuable patents is held by a relatively small number of concerns. In other groups the distribution of valuable patents is more general. There are a number of group licensing arrangements in force at the present time, in different branches of the industry, and most of these seem to work very well. There is no justification whatever for disturbing such arrangements; there is, on the

other hand, every reason why they should be studied with a view to determining whether similar arrangements, duly modified to take care of the exigencies encountered, might not be useful in other branches of the industry.

Considering this whole question, it should be remembered that the cost of patent litigation is often high, so high that there are unquestionably a number of valuable patents in the industry which are not being enforced because of fear on the part of the owners of being involved in unduly high legal expense. On the other hand, it will doubtless be found that certain manufacturers are handicapped in their enterprises by their fear of these patents, or by their unwillingness to infringe them, even though they are not being aggressively enforced.

Your committee is satisfied that no general formula can be devised; that each case must be studied on its merits.

New Orleans Cars to Be Delivered in November

Details for the twenty new cars ordered by the New Orleans Public Service, Inc., on Aug. 22, 1927, have been released. The cars are being built by the St. Louis Car Company and the Perley A. Thomas Car Company and will be delivered near the end of November. They are all-steel, double-truck, double-end cars designed for one-man or two man operation. The seating capacity is 52 and the total weight 40,000 lb. Previous mention of the order appeared in the JOURNAL of Aug. 20.

The specifications as given by the New Orleans Public Service are as shown below:

Number of cars.....	20
Date order was placed.....	Aug. 22, 1927
Date of delivery.....	90 days
Builder of car body.....	Ten, St. Louis Car Company; ten, Perley A. Thomas Car Company
Type of car.....	Double-truck, double-end, one-man, two-man safety car
Seating capacity.....	52
Weight.....	Total, 40,000 lb.
Length over bumpers.....	48 ft. 2 in.
Length of body.....	34 ft. 2 in.
Width over all.....	8 ft. 7 in.
Height, rail to trolley base.....	11 ft. 1 1/2 in.
Body, type.....	Steel, arched roof
Interior trim.....	Cherry
Roof.....	Poplar and No. 8 duck
Air brakes.....	Westinghouse air brake and General Electric
Axles.....	Standard Forging Company
Bumpers.....	Hedley anti-climber
Buzzers.....	Faraday
Car trimmings.....	Bronze
Conduits and junction boxes.....	Steel
Control.....	K-35-JJ
Curtain fixtures.....	Curtain Supply Company
Curtain material.....	Pantasote
Destination signs.....	Keystone
Door-operating mechanism.....	National Pneumatic
Gears and pinions.....	General Electric and Westinghouse
Hand brakes.....	Peacock staffers
Headlights.....	Ohio Brass, type 2P
Headlining.....	Agasote
Journal boxes.....	Brill M.C.B.
Lightning arresters.....	Aluminum cell
Motors.....	Four G.E. 265-G and Westinghouse 510-E
Paint.....	Muroby Varnish Co.
Registers.....	International R-11
Sanders.....	Nichols-Lintern
Sash fixtures.....	Curtain Supply Co., brass sash
Seats.....	Hale & Kilburn
Seating material.....	Wood slat
Side and center bearings.....	Brill
Slack adjusters.....	American Brake Co., type "K"
Springs.....	Brill
Step treads.....	Kass
Trolley catchers.....	Ohio Brass
Trolley base.....	Ohio Brass No. 11394
Trucks.....	Brill 76-E
Ventilators.....	Railways Utilities Co.
Wheels.....	Southern Car Wheel Co.
Wheel Guards.....	H-B life guard Consolidated Car Fender Company
Miscellaneous.....	Ellicon 1-in. white enamel stanchions

Trial Trolley Buses for Penang Completed

Last year the municipality of Georgetown, Penang, Malaya, decided to start trackless trolley service and an order was placed in England for three vehicles for trial. These vehicles have now been completed and are about to be shipped.

Apart from the fact that they have the driving motor in an extreme forward position in order to obtain the best possible loading line, the chassis in all respects built on the same principles as the improved type of trolley is fitted with pneumatic tires, concerning which an article was published in this paper.

The body is of a type suitable for the use of natives and is provided with wooden slatted seats in place of upholstered seats. The whole of the framework is of teak instead of European woods. The body has a seating

capacity of 35. The windows are made to drop and are fitted with sun blinds. The entrance is at the rear, with a low loading platform. Doors are provided on both sides of the driver's compartment, one being for the use of the driver and the other for staff use.

Ten One-Man, Two-Man Cars for North Shore & Milwaukee

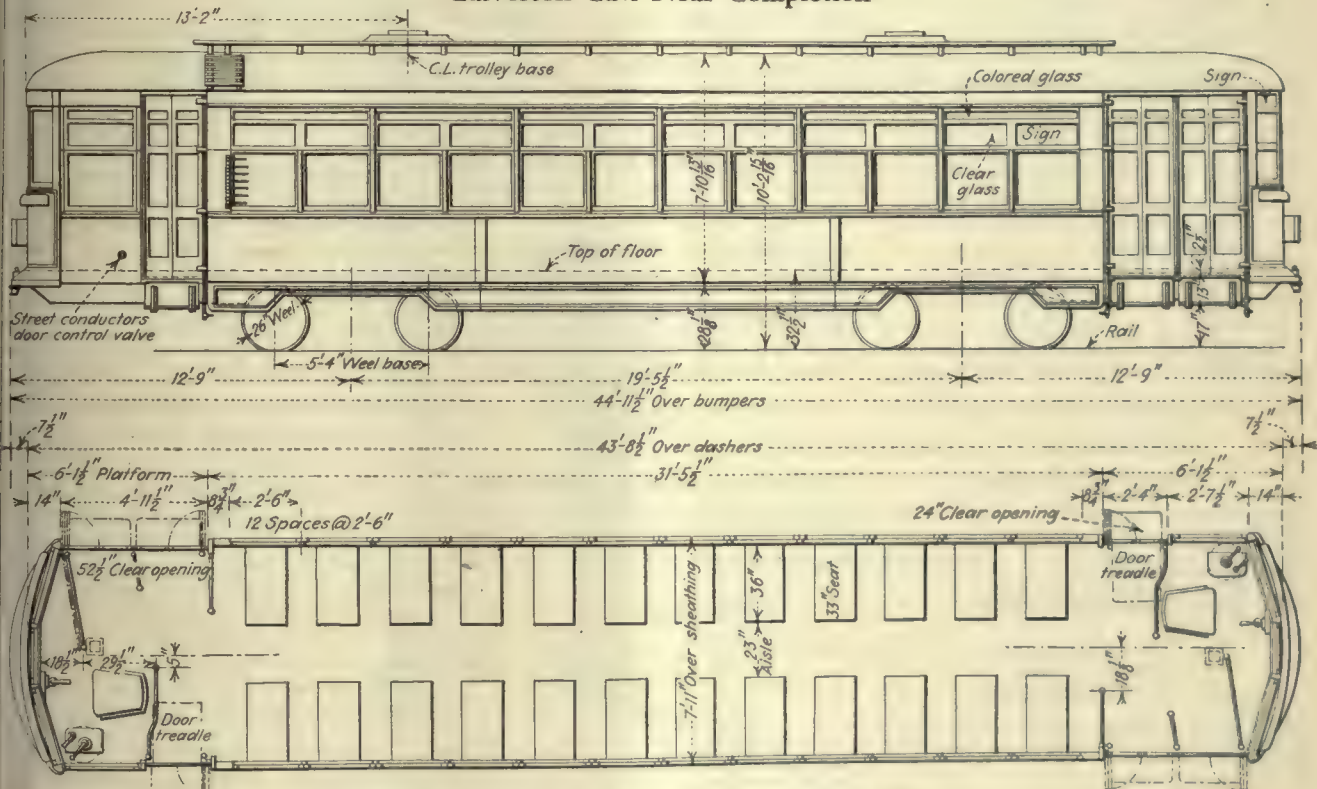
Ten new double-truck, one-man, two-man city type cars of modern design have been ordered by the Chicago, North Shore & Milwaukee Railroad, Chicago, Ill., from the St. Louis Car Company. The units will be 50 ft. long and they will be equipped throughout with the latest safety controls and devices. They will replace the present single-truck, one-man, safety units now in service on the Milwaukee city division of the road. A color scheme of orange and maroon has been specified for the exterior.

Metal Markets Mark Time

Developments in the non-ferrous metal markets during the week ended Oct. 11 have been unimportant. Zinc prices are a little higher and tin is a little easier. Lead and copper are virtually unchanged. Copper and zinc have been very quiet, this being attributable in the case of zinc to a very active week just preceding. As for copper, this is the third successive dull week. Lead has been bought in good volume and consumers likewise have been in the tin market for fair amounts of metal.

Copper buying in large volume that producers have been expecting to develop has not begun yet, the past week being the smallest in point of tonnage sold for two months at least. Only two sellers did business under 13.25 cents delivered in Connecticut, but the tonnage at lower figures exceeded that at the even quarter by a good margin. On Oct. 6 several good sales were made at

Galveston Cars Near Completion



New Galveston cars will be operated as one-man units

Galveston Electric Company, Galveston, Tex., is expecting delivery in the near future of four double-end, double-truck cars from the American Car Company, St. Louis, Mo. The order was placed on Feb. 24, as noted in a recent issue of the ELECTRIC RAILWAY JOURNAL.

The cars, which will be of semi-steel construction, will have a length over all of 44 ft. 11 1/2 in. and will have 24 double seats upholstered in genuine hand-buffed leather. General Electric No. 510-A motors have been specified.

The principal specifications of the new units are appended here:

Number of cars ordered.....	4
Builder of car body.....	American Car Company, St. Louis, Mo.
Bolster centers.....	19 ft. 5 1/2 in.
Length over all.....	44 ft. 11 1/2 in.
Length over body posts.....	31 ft. 5 1/2 in.
Truck wheelbase.....	5 ft. 4 in.
Width over all.....	8 ft. 2 in.
Height, rail to trolley base.....	132 in.
Window post spacing.....	30 in.
Body.....	Semi-steel
Roof.....	Arch
Doors.....	End
Air brakes.....	Westinghouse
Axles.....	A.E.R.A.
Car signal system.....	Faraday
Compressors.....	DH-16
Control.....	K-75
Couplers.....	American Car Company
Curtain fixtures.....	National Lock Washer Company
Curtain material.....	Double-faced Pantasote
Destination signs.....	Hunter
Door mechanism.....	American Car Company
Doors.....	Folding

Fare boxes.....	Johnson DM-3
Floor covering.....	Rubber tiling
Headlights.....	Golden Glow SM-95
Headlining.....	Huskelite
Interior trim.....	Mahogany, bronze nickel-plated
Journal bearings.....	Plain
Journal boxes.....	Symington
Lamp fixtures.....	Dome type
Motors.....	Four General Electric 510A, inside hung
Roof material.....	Canvas
Sash fixtures.....	Schechter post casing
Seats.....	Brill 201-D
Seat spacing.....	30-in.
Seating material.....	Genuine hand-buffed leather
Slack adjusters.....	Westinghouse type E
Steps.....	Folding
Step treads.....	Feralun
Trolley catchers.....	Keystone
Trolley base.....	Ohio Brass Company
Trolley wheels.....	Holland
Trucks.....	Brill 177-E-1-X
Wheels.....	26-in. Davis cast steel
Wheelguards.....	H.B. six-bar type
Special devices.....	Economy meters

13.125 cents, but 13.15 and 13.175 cents was the ruling figure Oct. 11. At the same time sales have been made each day during the week at 13.25 cents, particularly on the last few days. Business in Europe has been quite satisfactory at the exporter's price of 13.50.

The buying of zinc that materialized in such large volume when the price sagged to 6 cents last week subsided as prices were advanced. Nevertheless a fair business was done and prices seemed firm at 6.075 cents Oct. 12, with still more being realized on occasional lots. Joplin concentrate sales were up last week, but production continues well above 15,000 tons per week. The principal buyers of slab zinc during the week have been brass melters, the galvanizers apparently having supplied themselves for the time being.

Most sellers sold satisfactory tonnages of lead during the last week, that metal being in considerably better demand than copper. Prices were unchanged, practically all sales being made on the basis of 6 cents St. Louis or 6.25 cents New York, the last named quotation also continuing as the contract price of the American Smelting & Refining Company. Desilverized lead in the Middle West, however, has sold nearer to a 6.05 cents St. Louis basis. Though the London price on prompt lead in London declined to a new low of £20 1s. 3d. Oct. 7, the market since then has turned stronger, so that Oct. 12 price was somewhat above that of Oct. 5.

Corroders continue to take good tonnages of lead, and a fair amount has been sold to ammunition makers in the last week.

The tin market was largely a routine affair until Oct. 11, when lower prices

in London brought offerings here as low as 57.75 cents for prompt Straits tin. Consumers then entered the market and quickly pushed the price up to 58 cents, at which level an appreciable tonnage was sold. Tin for shipment from the Straits has averaged about a half-cent less than prompt, and 99 per cent has been available for from $\frac{1}{4}$ to 1 cent below the Straits quotation.

Soft Seats Popular in London

So popular has been the introduction of spring cushioned seats in the lower decks of the London tramway cars that the County Council has now decided to provide similar seats on the upper decks. The cost is estimated at £37 per car.

SHOPS AND BUILDINGS

BOSTON ELEVATED RAILWAY, Boston, Mass., is making some changes at the Everett terminal station, where it is enlarging platforms and building new tracks. The purpose is to provide for more traffic, give station accommodations to local passengers so that they can take cars inside the station, and also to provide storage space for cars which now have to lay over at Malden Square. This will relieve Malden Square of congestion and afford a better schedule out of the Everett terminal station.

INTERNATIONAL BUS CORPORATION, a subsidiary of the International Railway Buffalo, N. Y., announces plans for the construction of a 91-ft. x 150-ft. steel and brick addition to its bus garage at Walden Avenue and Lathrop Street.

TRADE NOTES

CUTLER-HAMMER MANUFACTURING COMPANY, Milwaukee, Wis., announces the removal of its Cleveland office from the Guardian Trust Building to the Guaranty Title Building.

LARS G. NILSON has resigned as chief engineer of the Nilson-Miller Corporation, Hoboken, N. J., to enter consulting engineering practice. Mr. Nilson has been connected with the Nilson-Miller firm for eighteen years. He will continue to serve the corporation as consultant.

KEYSTONE CARBON COMPANY, Easton, Pa., has placed on the market what it considers an entirely new material for metal and semi-metal brush application. Factors taken into consideration in the manufacture and development of this new material were increase in friction-resisting properties and very low electrical resistance.

TRICO FUSE MANUFACTURING COMPANY, Milwaukee, Wis., announces an improvement in its ferrule type renewable fuses. The improvement is said to reduce the time spent in renewing fuses and eliminates all small loose parts. This is accomplished by a method of using spring retainers on the end caps to hold the end screws. There are now only two parts and the renewal element. The general design of the fuse requires the removal of only one cap when renewing. This improvement has been made in addition to the recent one on the knife-blade type fuse. Samples and literature are available by writing the manufacturer.

ELECTRIC RAILWAY MATERIAL PRICES—OCT. 11, 1927

Metals—New York

Copper, electrolytic, cents per lb.	13.0
Lead, cents per lb.	6.25
Nickel, cents per lb.	35.00
Zinc, cents per lb.	6.075
Tin, Straits, cents per lb.	58.0
Aluminum, 98 or 99 per cent, cents per lb.	26.00
Babbitt metal, warehouse, cents per lb.	
Commercial grade.	61.00
General service.	31.50

Bituminous Coal

Smokeless mine run, f.o.b. vessel, Hampton Roads.	\$4.175
Somerset mine run, Boston.	1.80
Pittsburgh mine run, Pittsburgh.	1.825
Franklin, Ill., screenings, Chicago.	1.775
Central, Ill., screenings, Chicago.	1.625
Kansas screenings, Kansas City.	2.675

Track Materials—Pittsburgh

Standard steel rails, gross ton.	\$43.00
Railroad spikes, drive, $\frac{1}{2}$ in. and larger, cents per lb.	2.85
Tie plates (flat type), cents per lb.	2.25
Angle bars, cents per lb.	2.75
Rail bolts and nuts, cents per lb.	3.90
Steel bars, cents per lb.	2.15
Ties, white oak, Chicago, 6 in. x 8 in. x 8 ft.	\$1.45

Hardware—Pittsburgh

Wire nails, base per keg.	2.55
Sheet iron (24 gage), cents per lb.	3.00
Sheet iron, galvanized (24 gage), cents per lb.	3.85
Galvanized barbed wire, cents per lb.	3.25
Galvanized wire, ordinary, cents per lb.	2.40

Waste—New York

Waste, wool, cents per lb.	14-20
Waste, cotton (100 lb. bale), cents per lb.	
White.	14-19.50
Colored.	9-16

Paints, Putty and Glass—New York

Linseed oil (5 bbl. lots), cents per lb.	10.5
White lead in oil (100 lb. keg), cents per lb.	13.75
Turpentine (bbl. lots), per gal.	\$0.56
Putty, 100 lb. tins, cents per lb.	5.25-5.50

Wire—New York

Copper wire, cents per lb.	13.25
Rubber-covered wire, No. 14, per 1,000 ft.	5.50
Weatherproof wire base, cents per lb.	15.75

Paving Materials

Paving stone, granite, 5 in.	
New York—Grade 1, per thousand.	\$150
Wood block paving 3 $\frac{1}{2}$ x 8 $\frac{1}{2}$ x 4, 16 lb. treatment, N. Y., per sq. yd.	\$2.70
Paving brick 3 $\frac{1}{2}$ x 8 $\frac{1}{2}$ x 4, N. Y., per 1,000 in carload lots.	51.00
Paving brick 3 $\frac{1}{2}$ x 8 $\frac{1}{2}$ x 4, N. Y., per 1,000 in carload lots.	45.00
Crushed stone, $\frac{1}{2}$ -in., carload lots, N. Y., per cu. yd.	1.85
Cement, Chicago consumers' net prices, without bags.	2.05
Gravel, $\frac{1}{2}$ -in., cu. yd., f.o.b. N. Y.	1.75
Sand, cu. yd., f.o.b. N. Y.	1.00

Old Metals—New York and Chicago

Heavy copper, cents per lb.	10.50
Light copper, cents per lb.	9.25
Heavy yellow brass, cents per lb.	7.00
Zinc, old scrap, cents per lb.	3.875
Lead, cents per lb. (heavy).	5.25
Steel car axles, Chicago, net ton.	\$17.00
Cast iron car wheels, Chicago, gross ton.	13.75
Rails (short), Chicago, gross ton.	15.25
Rails (relaying), Chicago, gross ton (65 lb. and heavier).	28.50
Machine turnings, Chicago, gross ton.	7.25

ADVERTISING LITERATURE

J. G. BRILL COMPANY, Philadelphia, Pa., is issuing loose-leaf fillers for its seat catalog No. 284, which deals with car and bus seats. The sheets under review feature the Brill No. 202-B-1 car type seat, with dimensions; a diagram of the Brill No. 301 and 130 car and bus type seat, with standard dimensions; and the Brill No. 201-D car type seat with dimensions and diagram.

IRVING IRON WORKS COMPANY, Long Island City, is mailing an illustrated postcard describing Irving "subway" flooring.

BEARDSLEY & PIPER COMPANY, manufacturer of sand conditioning and conveying equipment and "Sandslingers," has mailed 4,500 copies of its house organ, *Better Methods*, to the trade by air mail. This is the first publication of any kind, so far as is known, that has used air mail as a means of distributing a complete issue. The stunt was a tribute to Col. Charles Lindbergh.

TIMKEN-DETROIT AXLE COMPANY, Detroit, Mich., has issued a folder entitled "The Theory of the Differential and How It Is Applied to Timken Axle-Worm Drive."

—and on the heaviest Interurbans— they specify—

Work Progressing on Five-Car Order for Philadelphia & Western

While no definite date has been announced for delivery of the five two-man all-steel interurban cars ordered by the Philadelphia & Western Railway, Norristown, Pa., from the J. G. Brill Company of Philadelphia, work on the units has progressed to a point where A. M. Robinson, publicity manager for the car company, has released the following specifications. As announced in the JOURNAL for Feb. 19, the cars will have an over-all length of 50 ft. 6 in. Their design includes smoking and passenger compartments and they will be mounted on Brill 27-MCB-2-X trucks, equipped with Westinghouse 535-B-1 inside hung motors. Wheels of 30-in. diameter have been specified. Doors will be located at both ends and in the center. The seats are upholstered in hand-buffed brown Spanish leather. Specifications follow:

Number of units.....	5
Type of unit.....	Two-man, motor, passenger, interurban, double end, double truck
Builder of car body.....	J. G. Brill Company
City and state.....	Philadelphia, Pa.
Date of order.....	1/28/27
Weights:	
Car body.....	26,070 lb.
Trucks.....	19,030 lb.
Equipment.....	17,985 lb.
Total.....	63,085 lb.
Booster centers.....	30 ft. 0 in.
Length over all.....	50 ft. 6 in.
Length over body posts.....	40 ft. 8 in.
Truck wheelbase.....	8 ft. 4 in.
Width over posts.....	9 ft. 3 in.
Height, rail to trolley base.....	13 ft. 3 in.
Window post spacing.....	20 in.
Body.....	All steel
Roof.....	Arch
Doors.....	Center and ends
Air brakes.....	Westinghouse AMM
Armature bearings.....	Plain
Axles.....	A.S.T.M. spec. A-2—21
Car signal system.....	Faraday buzzers
Compressors.....	DH-25
Conduit.....	Metal
Control.....	Westinghouse ALMPC
Couplers.....	Tomlinson, Form 16
Curtain fixtures.....	Curtain Supply Company's No. 48
Curtain material.....	Fantasote
Destination signs.....	Railway company's portable
Door mechanism.....	National Pneumatic
Doors.....	Sliding
Energy-saving device.....	Economy wait-hour meter
Finish.....	Paint
Floor covering.....	Tufo
Gears and pinions.....	Nuttall solid forged steel
Glass.....	Libbey-Owens ✓
Hand brakes.....	National staffless
Heaters.....	Railway Utility Company's truss plank
Headlights.....	Golden Glow HDD—No. 128
Headlining.....	Agasote
Interior trim.....	
Journal bearings.....	Statuary bronze, Haskell's side linings
Journal boxes.....	Prommet, plain
Lamp fixtures.....	Brill
Motors.....	Four Westinghouse 535-B-1, inside hung
Painting scheme.....	Moss green
Registers.....	Ohmer
Roof material.....	✓ 1/2-in. poplar covered with No. 8 canvas
Sash fixtures.....	Brill Renitent
Seats.....	
Three cars Brill 202-B-1, two cars Hale & Kilburn	
Seat spacing.....	20 in.
Seating material.....	Hand-buffed brown Spanish leather
Slack adjusters.....	American Brake Company's type J
Steps.....	Stationary, triple
Step treads.....	Wood
Trolley base.....	U. S. No. 20
Trolley wheels.....	No. 60-B
Trucks.....	Brill 27-MCB-2-X
Ventilators.....	Railway Utility Company
Wheels.....	Standard r.s., diameter 30 in.

(Electric Railway Journal)
(Aug. 27, 1927)

“PEACOCK”
Reg. U. S. Pt. Office.
STAFFLESS BRAKES



The
“Peacock”
Staffless

That “Peacock” Staffless Brakes are the choice of the Electric Railways in every type service is again evidenced by the recent order of the Philadelphia & Western Railway for five new 63,085 lb. interurban cars!

These new cars, being built by the J. G. Brill Company, are to be “Peacock” Staffless equipped.

Modern car design demands the “Peacock” Staffless, because of its many advantages: Unfailing reliability, light weight, low installation and maintenance costs, little platform space required, maximum braking power and many others.

May we mail detailed information?

National Brake Company, Inc.
890 Ellicott Square
Buffalo, N. Y.

Canadian Representative:

Lyman Tube & Supply Co., Ltd., Montreal, Can.



One of the Goodyear-equipped buses of the Tampa Electric Company, Tampa, Fla.

MOST important factor of all in the growth of any bus service is the public satisfaction with the service.

For out of public satisfaction comes public patronage, assuring the necessary revenue to meet expenses and pay a profit.

And of all the elements in bus operation that contribute to public satisfaction, confidence and patronage, none is so essential as uninterrupted service.

The dependable, on schedule service that Goodyear Bus Tires do so much to maintain.

* * *

Goodyear Pneumatic Cord Bus Tires are more durable and more trouble-proof largely because they are made with SUPERTWIST—the new cord material which eliminates shoulder breaks and other casing troubles.

This patented cord fabric was invented and developed by Goodyear to overcome carcass failures and diminish tire changes.

It is more elastic than ordinary cord fabric.

Stretches farther before it breaks. Withstands flexing better and longer before “fabric fatigue” sets in.

* * *

The dependable, long-lived service they give is one reason why Goodyear Tires are used on the buses of the Tampa Electric Company, Tampa, Florida.

“For the past year we have been using Goodyear Tires on our buses operating city service,” writes Manager T. J. Hanlon, Jr.

“The local Goodyear Branch has rendered 100% service; the mileage we have obtained has been beyond our expectations, and tire failures on the road have been reduced to a minimum.”

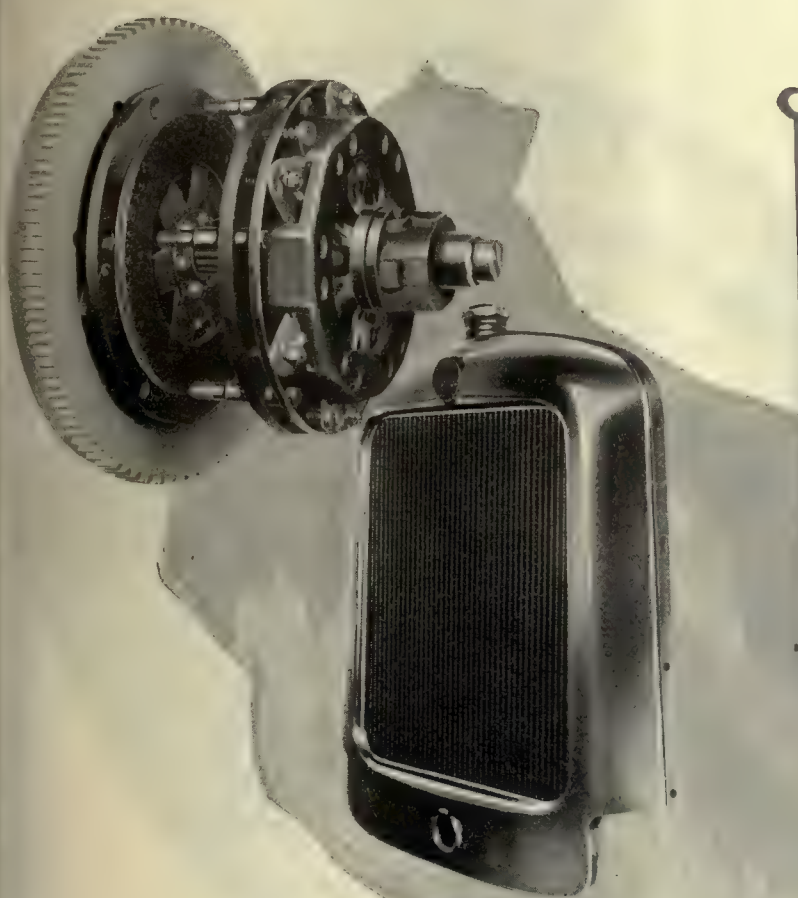
The mileages to which Mr. Hanlon refers include 39,021 miles for one Goodyear Tire, and still-in-service mileages of 26,826 for another; 25,207 for a third; 22,418 for a fourth; 21,667 for a fifth, and so on through a long record of reliable, trouble-free, low-cost Goodyear Tire miles.

For every Goodyear Cord Bus Tire there is an equally fine Goodyear Tube, built especially to the needs of bus service

GOODYEAR

Copyright 1927, by The Goodyear Tire & Rubber Co., Inc.

POWER



Our radiators are correctly designed to properly cool the motor—our clutches to easily transmit the maximum power developed.

LONG
MANUFACTURING
COMPANY
Detroit • Michigan



LONG

LONG PRODUCTS—AUTOMOTIVE CLUTCHES AND RADIATORS

THE sturdiness and tough resistance to wear that is built into Kelly Bus Balloons gives bus operators an opportunity to add to the riding comfort of their passengers without increasing their operating costs.

KELLY-SPRINGFIELD TIRE CO.
General Motors Bldg. New York, N. Y.



KELLY^{SPRINGFIELD} BUS BALLOONS

101 YEARS OF MANUFACTURING EXPERIENCE

Cane Webbing may
be ordered through
any H-W sales office.



Interior of one of the Eastern Mass. Street
Railway cars, showing the installation of our
No. 327-M.



A MODERN CAR SEAT!

THE Eastern Massachusetts Street Railway was in the market for a modern car seat that would increase the attractiveness and comfort of its cars. It finally selected our 327-M—the new, fast-selling Heywood-Wakefield design shown above.

This seat has deep, double spring cushions. Mechanism rails are set in. The individual backs are properly pitched for comfort.

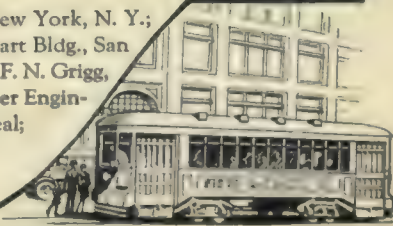
Our car seating experts will be glad to help you decide on the best seating equipment for your needs. This service is free through any H-W sales office.

*We shall be glad to send you complete information
on this practical seat, as well as a copy of our new
Bus Seat Catalogue.*



Heywood-Wakefield
REG. U.S. PAT. OFF.

Heywood-Wakefield Co., Wakefield, Mass.; 516 West 34th St., New York, N. Y.;
439 Railway Exchange Bldg., Chicago, Ill. H. G. Cook, Hobart Bldg., San
Francisco, Cal. The G. F. Cotter Supply Co., Houston, Texas. F. N. Grigg,
630 Louisiana Ave., Washington, D. C. The Railway & Power Engi-
neering Corp., 133 Eastern Ave., Toronto; Montreal;
Winnipeg, Canada.





Your Profits Depend on Reliability of Service

Tire equipment is a vital factor in transportation service. And for this reason the improved construction of the Fisk Motor Coach Balloon is of paramount importance.

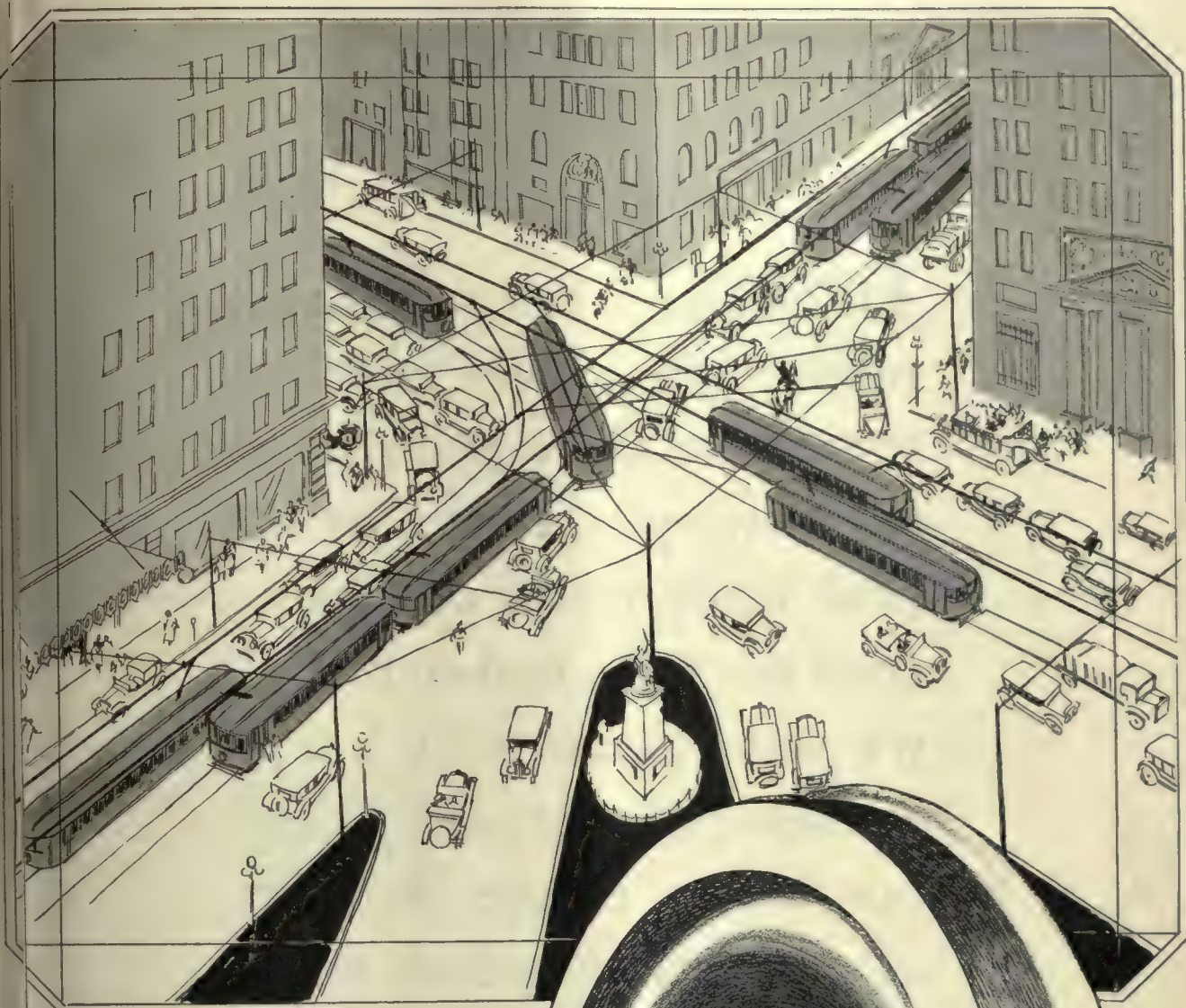
Its tough, heat-resisting, Non-Skid tread, its "Fillerless" Cord construction (a patented Fisk process) and its multi-cable bead (original with Fisk) are advantages which not only make this tire more reliable but materially cut the cost of motor coach tire mileage.

Write for information about what the Fisk Motor Coach Balloon has done for other railways which operate motor coach lines

FISK TIRES

For the Finest Motor Coaches

THE FISK TIRE COMPANY, Inc.
Chicopee Falls, Mass.



Year by Year The Congestion Grows

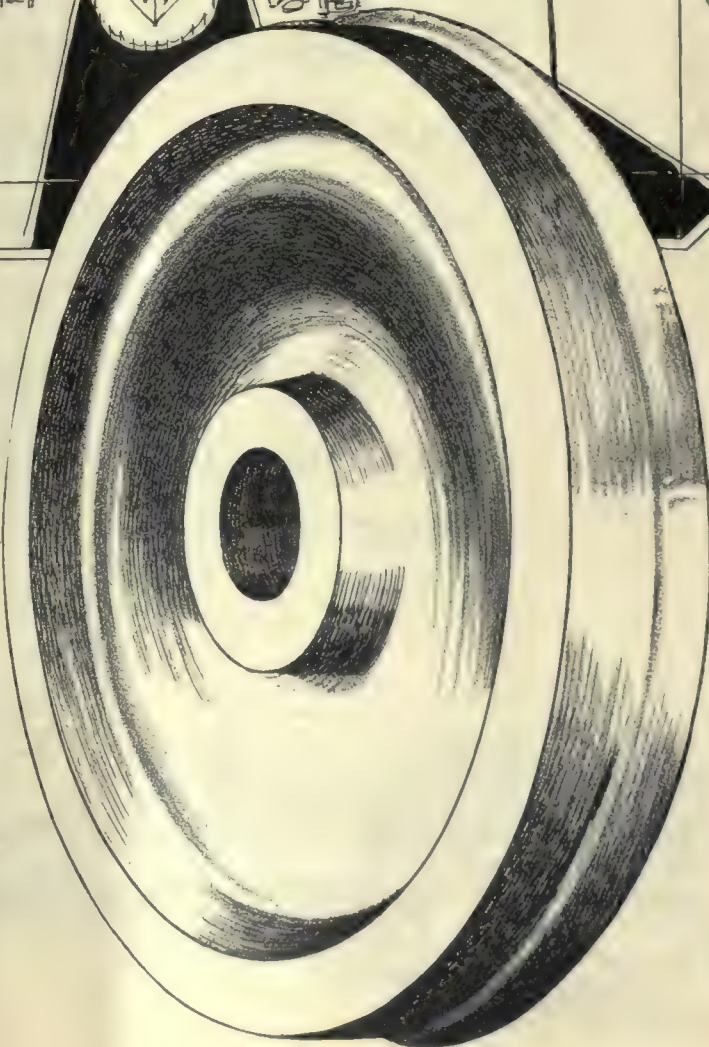
Year by year the country's population clusters more and more about the metropolitan centers. Business sections, crowded before, are beehives of congestion now—and regardless of how rapidly this congestion grows, the street car company is expected to provide adequate transportation facilities.

It is this requirement of 100% service in peak periods that causes the management of street car companies to be so careful of their operating equipment. It is this requirement also that is responsible for the widespread use of Gary Wrought Steel Wheels in electric railway service. A well made, wrought steel product—an iron-clad inspection system—an organization trained in electric railway equipment.

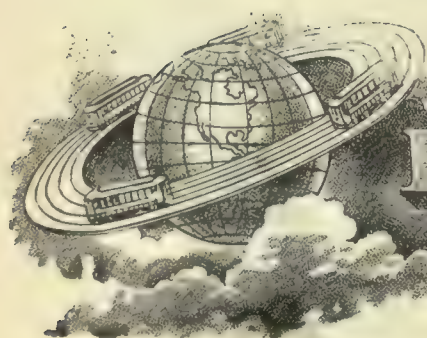
Our wheel engineers are at your command.

Illinois Steel Company

General Offices: 208 South La Salle Street
Chicago, Illinois



JUST as the electric railway companies have to compile and be guided by exhaustive statistics as to peak loads, traffic densities, costs per mile, and so forth, we must constantly keep ourselves informed as to purchasing power, density of population and all vital market information in order to maintain our service as an active asset of your service.



Barron G. Collier

INCORPORATED

CANDLER BLDG. NEW YORK

WINDOWS DO MAKE A DIFFERENCE

Modern Transportation calls for Comfort

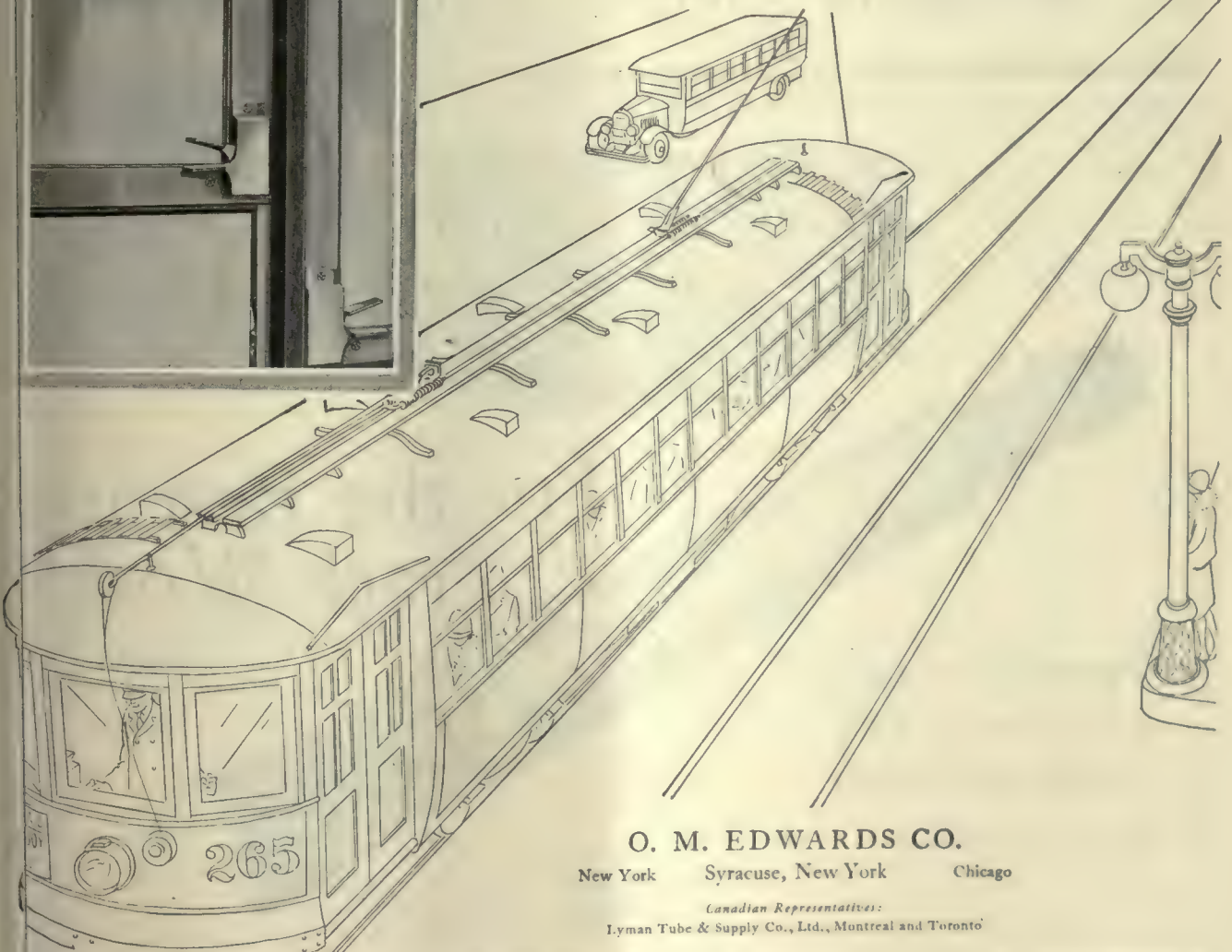
Edwards Metal Sash

"PASSENGER COMFORT" is a commodity that has increased many times over. And recently the strides have been tremendous.

For forty years this company has helped to make passengers more comfortable by constantly improving car windows.

We have made a big step forward with Edwards Metal Sash, for steam and electric railway passenger cars, and for motor coaches.

Our profusely illustrated Catalog S lists many electric railway lines using Edwards Metal Sash, and tells the many reasons why. Shall we send you a copy?



O. M. EDWARDS CO.

New York Syracuse, New York Chicago

Canadian Representatives:

Lyman Tube & Supply Co., Ltd., Montreal and Toronto

*Type EAS—Champion*

Especially *For High Speed Service*

High speed trains induce high frequency vibrations—reduce metal's resistance—cause its destruction.

Type EAS, Erico Champion Rail Bonds ward off this threat of destruction.

Rope lay stranding, wires tightly interwoven—

rail vibration to any single strand eliminated, yet the bond is extremely flexible—vibration completely dampened at weld zone by heavy copper sheath.

No rail bond outlives Erico EAS. Let us give you details. Address—

The Electric Railway Improvement Co.

2070 E. 61st Place, Cleveland, Ohio



For the Best in Track Work

Forty-five years
experience and
the best of mod-
ern facilities.

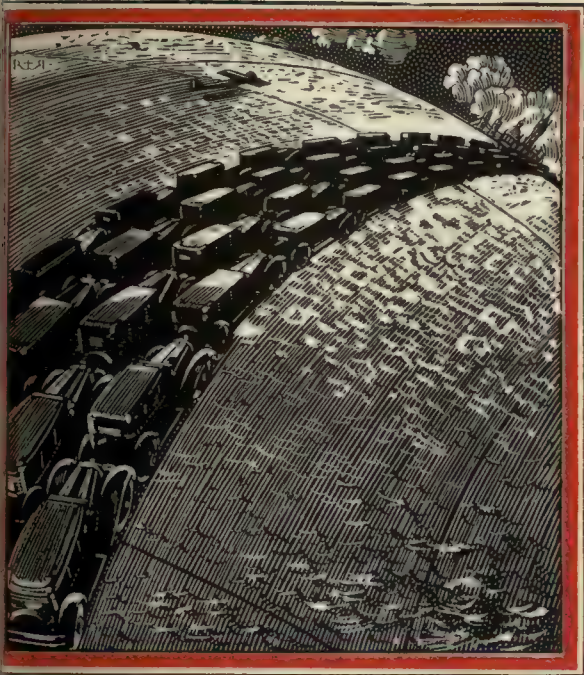
*Send Us
Your
Inquiries*

THE BUDA CO.
Harvey, Ill.



London speaking. . . We want

1000 cars



"I HAD URGENT NEED yesterday," writes a London barrister, "to confer with a brother lawyer in New York.

. . . The conference was disposed of satisfactorily in 3 minutes."

A New York department store sold so much of a certain silk that it had to know whether more could be shipped from London immediately. More was quickly ordered by transatlantic telephone.

"I cannot resist letting you know," writes the president of another American

THE MANAGING DIRECTOR of a motors company in London talked with an automobile factory in the American Middle West and ordered a thousand cars. Amount involved, \$1,500,000. Communication was over the regular long distance lines, and by radio telephone across the Atlantic. Delivery dates and other details were arranged; business conditions of the moment were discussed.

company, "the result of a telephone call with London this morning. . . . It was the thrill of a lifetime. . . . And it's wonderful how much conversation can be crowded into a four or five minute talk."

Use transatlantic service for business and social calls. It's simplicity itself. Just ask for "Long Distance" and place your call in the usual way. . . . *Number, please?*

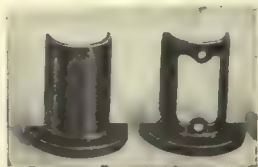
BELL LONG DISTANCE SERVICE



What Do



Bearings



Cost?

THE cost of your bearings is determined by the wear they give divided by their price. The wear of Columbia Journal, Armature, Axle, Compressor and Motor Bearings is assured by our specially developed bronze, accurately machined with perfect halves and complete interchangeability. Their price is held to moderate limits by our large scale and efficient methods of production. It's a combination of long wear, low price and reduced cost which you cannot well afford to miss.



The **Columbia Machine Works & M.I. Co.**

263 Chestnut Street, Cor. Atlantic Avenue

Brooklyn, N. Y.

The advertisements in the **SEARCHLIGHT SECTION** *of this paper*

constitute the most comprehensive group of "live" opportunities to be found in any publication serving this industry.

Each announcement represents a current Want of a concern or individual in the industry with some element of profit in each for whoever can fulfill the need. Some have money saving possibilities, others are opportunities for more business; many are employment opportunities while still others offer chances to buy going businesses, plants, property, etc.

"Searchlight" advertisements are constantly changing. New opportunities find their way into this great Want medium each issue. Regular consultation of the "Searchlight" pages should be as important to the careful reader as reading editorial articles of his particular liking. One is news of the industry, the other, the NEWS OF OPPORTUNITIES being offered in the industry. No one can afford to overlook opportunities.

For Every Business Want
"Think SEARCHLIGHT First"

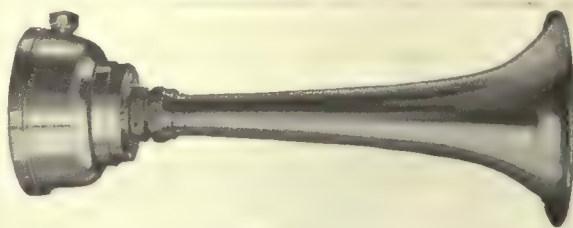


Structural Shapes • Steel Sheet Piling
Plates • Skelp
Bars and Bar Mill Products
Bands • Hoops
Axles • Wrought Steel Wheels
Rails • Rail Joints
Steel Cross Ties

CARNEGIE STEEL COMPANY
General Offices • Carnegie Building • 434 Fifth Avenue
PITTSBURGH PENNSYLVANIA



1839



Strombos Signals for Railway Service

A pleasing sound of tremendous volume is emitted from the powerful Strombos Signal which is admirably suited for railway service. Day in, day out, it broadcasts a warning of approaching danger and promotes safe and efficient railway operation.

The Strombos Signal operates on an air pressure of 10 lbs. and over and is controlled by a lever valve and cord. It uses only 1/10 the volume of air required by a whistle. It has no moving parts which might fail in the emergency.

Write us for more complete data.

AMERICAN STROMBOS CO.
INCORPORATED
18th & Market Sts., Philadelphia, Pa.



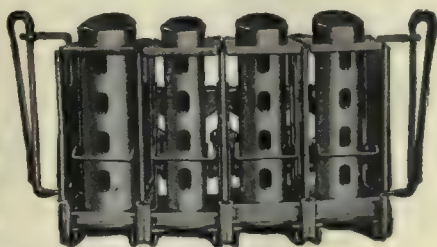
JOHNSON FARE COLLECTING SYSTEMS



Johnson Electric Fare Boxes and overhead registers make possible the instantaneous registering and counting of every fare. Revenues are increased 1½ to 5% and the efficiency of one-man operation is materially increased. Over 4000 already in use.

When more than two coins are used as fare, the Type D Johnson Fare Box is the best manually operated registration system. Over 50,000 in use.

Johnson Change-Makers are designed to function with odd fare and metal tickets selling at fractional rates. It is possible to use each barrel separately or in groups to meet local conditions. Each barrel can be adjusted to eject from one to five coins or one to six tickets.



Johnson Fare Box Co.

4619 Ravenswood Ave., Chicago, Ill.

KERITE



ELECTRICAL INSULATION

MICANITE and EMPIRE

Micanite and Super-Micanite
Sheets, Commutator Segments, and
Commutator Rings.

Micanite Tubes and Washers

Linotape, Seamless or Sewn Bias
(Yellow or Black Varnished Tapes)

Empire Oiled Cloths and Papers
(Yellow or Black)

Compounds, Varnishes, Etc.

Send for catalog and helpful booklet on Commutator
Insulation and Assembly

MICA INSULATOR COMPANY

Largest manufacturers in the world of mica insulation.
Established 1893.

New York: 68 Church St. Chicago: 542 So. Dearborn St.

Cleveland
San Francisco

Pittsburgh
Los Angeles

Cincinnati
Seattle

Works: Schenectady, New York. Victoriaville, Canada; London, England



Clark-Williams Tubular Iron Pole Reinforcing and Extension Clamps

Years can be added to the life of any iron pole which has become corroded at the ground level with our REINFORCING CLAMPS, or added height may be obtained by using the EXTENSION CLAMPS.

ALSO MOUNTS FOR WOOD POLES.

Ask for quotations on your requirements.

The Clark-Williams Engr. Co.
886 Main St., Bridgeport, Conn.

Represented in Canada by the Canadian Line Materials, Ltd., Toronto, Ont.

TRIBLOC Chain Hoists

An improvement that makes
a Tribloc easier to use

It is an established policy of Ford Chain Block Company to adopt only those ideas which actual practice has shown will be to the advantage of our customers. If shop use and engineering tests over a long period of time demonstrate the value of a new idea, it is then incorporated into the construction of these good hoists.

This new Ball Bearing Hook, therefore, becomes a part of Tribloc Chain Hoists with the assurance that it has demonstrated its value. Let us show you this improved load hook. Let us tell you why the malleable iron and forged steel construction of Ford Triblocs mean a better, long-lived hoist.

Let us send you a catalog which shows the complete line of Ford Triblocs, Screw Hoists and Differential Hoists, as well as several special types.

FORD CHAIN BLOCK COMPANY
Second and Diamond Sts., Philadelphia, Pa.



The cut at left shows the standard Ford Tribloc in the 1/2- to 2-ton size.



"Nick Lynt" says:

"No exhaust gases,
no engine fumes."

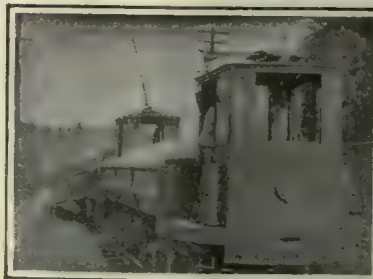
"The construction of the N-L Heater prevents the entrance of exhaust gases and engine fumes into the body. All joints are heavily brazed, and the Heater is so suspended that strained joints are impossible."

Write for Information

THE NICHOLS-LINTERN CO.

7960 Lorain Ave., Cleveland, Ohio

The DIFFERENTIAL CAR



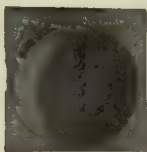
Standard on
60 Railways for

Track Maintenance
Track Construction
Ash Disposal
Coal Hauling
Concrete Materials
Waste Handling
Excavated Materials
Hauling Cross Ties
Snow Disposal

Use These Labor Savers

Differential Crane Car
Clark Concrete Breaker
Differential 3-way Auto Truck Body
Differential Car Wheel Truck and Tractor

THE DIFFERENTIAL STEEL CAR CO., Findlay, O.



Complete satisfaction

Operating perfectly and requiring minimum attention for maintenance and lubrication, Earll Catchers and Retrievers give genuinely satisfactory results. Their refinement of design, and mechanical superiority are summarized in the following five features, peculiar to Earll construction.

No-wear Check Pawl
Free-Winding Tension Spring
Ratchet Wind
Emergency Release
Perfect Automatic Lubrication

Earll Catchers and Retrievers
C. I. EARLL, York, Pa.

Canadian Agents:
Railway & Power Engineering Corp., Ltd., Toronto, Ont.
In All Other Foreign Countries:
International General Electric Co., Schenectady, N. Y.

Why



Le Carbone? Carbon Brushes?

Reason No. 9

Figure out the cost of carbon brushes per car mile. You will find that not only do "Le Carbone" Brushes cost you less per car mile but that their uniform dependability lowers the entire cost of operation.

They talk for themselves

W. J. Jeandron

Factory Terminal Bldg.,
Fifteenth Street, Hoboken, N. J.
Pittsburgh Office: 634 Wabash Bldg.
Chicago Office: 1657 Monadnock Block
San Francisco Office: 525 Market Street
Canadian Distributors: Lyman Tube & Supply Co., Ltd.
Montreal and Toronto



Drip Points for Added Efficiency

They prevent creeping moisture and quickly drain the petticoat in wet weather, keeping the inner area dry.

The Above Insulator—No. 72—Voltages—Test—Dry 64,000
Wet 31,400, Line 10,000.

Our engineers are always ready to help you on your glass insulator problem. Write for catalog.

Hemingray Glass Company
Muncie, Ind.

Est. 1848—Inc. 1870

1 man strips car in 6 hours the OAKITE way!

DOWN to the body metal! The car had been in service 12 years and had accumulated as many coats of paint. But Oakite stripping left it in fine condition for priming and repainting. No hand scraping was necessary around rivet heads.

Here Oakite materials and methods cut cost about 20%, while stripping time was considerably shortened.

Every street railway official knows that new-looking street cars promote better public relations. Efficient and safe Oakite cleaning will prove invaluable in keeping rolling stock always clean and bright, inside and out. Write for booklet, "Cleaning in Car Shops." No obligation.

Oakite Service Men, cleaning specialists, are located in the leading industrial centers of the U. S. and Canada

Oakite is manufactured only by
OAKITE PRODUCTS, INC., 28B Thames St., NEW YORK, N. Y.
(Formerly OAKLEY CHEMICAL CO.)

OAKITE

Industrial Cleaning Materials and Methods

Bankers and Engineers

Ford, Bacon & Davis Incorporated Engineers

115 Broadway, New York
PHILADELPHIA CHICAGO SAN FRANCISCO

STONE & WEBSTER

Incorporated

Design and Construction
Examinations Reports Appraisals
Industrial and Public Service Properties

NEW YORK BOSTON CHICAGO

SANDERSON & PORTER ENGINEERS

PUBLIC UTILITIES & INDUSTRIALS

Design Construction Management
Examinations Reports Valuations

CHICAGO NEW YORK SAN FRANCISCO

ALBERT S. RICHEY ELECTRIC RAILWAY ENGINEER WORCESTER, MASSACHUSETTS

REPORTS - APPRAISALS - RATES - OPERATION - SERVICE

A. L. DRUM & COMPANY

Consulting and Constructing Engineers

VALUATION AND FINANCIAL REPORTS
RATE STUDIES FOR PRESENTATION TO PUBLIC SERVICE
COMMISSIONS
CONSTRUCTION AND MANAGEMENT OF
ELECTRIC RAILWAYS

230 South Clark Street, Chicago, Ill.

STEVENS & WOOD

INCORPORATED

ENGINEERS AND CONSTRUCTORS

120 BROADWAY, NEW YORK

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0301

LEGAL NOTICE

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912

Of Electric Railway Journal, published weekly at New York, N. Y., for Oct. 1, 1927.

State of New York } ss.
County of New York }

Before me, a Notary Public in and for the State and county aforesaid, personally appeared C. H. Thompson, who, having been duly sworn according to law, deposes and says that he is the Secretary of McGraw-Hill Publishing Company, Inc., Publishers of Electric Railway Journal, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, McGraw-Hill Publishing Company, Inc., 10th Ave. at 36th St., New York, N. Y. Editor, Charles Gordon, 10th Ave. at 36th St., New York, N. Y. Managing Editor, Morris Buck, 10th Ave. at 36th St., New York, N. Y. Business Manager, L. F. Stoll, 10th Ave. at 36th St., New York, N. Y.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.) McGraw-Hill Publishing Company, Inc., 10th Ave. at 36th St., New York, N. Y. James H. McGraw, 10th Ave. at 36th St., New York, N. Y. James H. McGraw, Jr., 10th Ave. at 36th St., New York, N. Y. Donald C. McGraw, 10th Ave. at 36th St., New York, N. Y. Harold W. McGraw, 10th Ave. at 36th St., New York, N. Y. Curtis W. McGraw, 10th Ave. at 36th St., New York, N. Y. James H. McGraw, James H. McGraw, Jr., and Malcolm Muir, 10th Ave. at 36th St., New York, N. Y., Trustees for: Harold W. McGraw, James H. McGraw, Jr., Donald C. McGraw, Curtis W. McGraw, Henry W. Blake, 10th Ave. at 36th St., New York, N. Y. Fred R. Low, 10th Ave. at 36th St., New York, N. Y. Mason Britton, 10th Ave. at 36th St., New York, N. Y. Anne Hugus Britton, McGraw-Hill Bldg., New York, N. Y. Grace W. Mehren, 30 West 88th St., New York, N. Y. Malcolm Muir, 10th Ave. at 36th St., New York, N. Y., Trustee for Lida Kelly Muir. Fred S. Weatherby, 271 Clinton Road, Brookline, Mass. Edwin S. Wilsey, 10th Ave. at 36th St., New York, N. Y. Edgar Kobak, 10th Ave. at 36th St., New York, N. Y. James L. Walsh, 10th Ave. at 36th St., New York, N. Y. Leonard D. & Arthur J. Baldwin, 27 Pine St., New York, N. Y., Trustees for: Franklin Baldwin, Grace Riker, Cynthia Hazelton, Arthur J. & Leonard D. Baldwin, 27 Pine St., New York, N. Y., Trustees for: Donald Baldwin The Grosvenor, Inc., stockholders of which are Arthur J. & Leonard D. Baldwin, Inc., 27 Pine St., New York, N. Y.

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5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is (This information is required from daily publications only.)

McGRAW-HILL PUBLISHING COMPANY, INC.

C. H. THOMPSON, Secretary.

Sworn to and subscribed before me this 30th day of September, 1927.

[Seal.] MARTIN J. WIEMER.

Notary Public Queens County Certificate No. 1819. Certificate filed in New York County No. 272.

(My Commission expires March 30, 1928.)

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Ohio Brass Co.
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Stands
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Bethlehem Steel Co.
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St. Louis Car Co.
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Railway Trackwork Co.
Bodies, Bus
Brill Co., The J. G.
Cummings Car & Coach Co.
St. Louis Car Co.
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Haskelite Mfg. Corp.
Boilers
Babcock & Wilcox Co.
Bolts & Nuts, Track
Illinois Steel Co.
Bond Testers
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Brake Adjusters
Brill Co., The J. G.
Cincinnati Car Co.
National Railway Appliance Co.
Westinghouse Traction Br. Co.

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American Brake Shoe & Foundry Co.
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Cincinnati Car Co.
Bridges, Steel
American Bridge Co.
Brushes, Carbon
Eureka Copper Products Co.
General Electric Co.
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Le Carbone Co.
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Brushholders
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American Bridge Co.
Bulkheads
Haskelite Mfg. Corp.
Bunkers, Coal
American Bridge Co.
Bus Lighting
National Railway Appliance Co.
Buses
Cummings Car & Coach Co.
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Bemis Car Truck Co.
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Irvington Varnish & Ins. Co.
Mica Insulator Co.
Carbon Brushes (See Brushes, Carbon)
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Electric Railway Equipment
Electric Railway Improvement Co.
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General Electric Co.
Hubbard & Co.
Ohio Brass Co.
Westinghouse E. & M. Co.
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Oakite Products, Inc.
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Crossings, Track (See Track Special Work)
Crossings, Trolley
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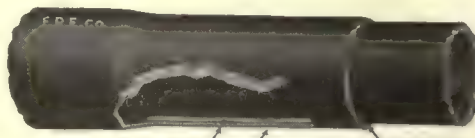
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American Steel & Wire Company

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AMELECTRIC PRODUCTS

BARE COPPER WIRE AND CABLE

TROLLEY WIRE

WEATHERPROOF WIRE
AND CABLE

PAPER INSULATED
UNDERGROUND CABLE

MAGNET WIRE

AMERICAN ELECTRICAL WORKS
PHILLIPSDALE, R. I.

Chicago, 20-32 West Randolph Street.
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NAUGLE POLES

WESTERN & NORTHERN CEDAR

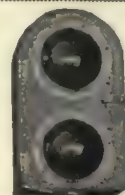
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New York - Columbus - Kansas City - Spokane - Vancouver - Boston

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220 36th St., Brooklyn, N. Y.

ELECTRIC HEATERS WITH OPEN COIL OR
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LOUISVILLE, KY.

BLOCK SIGNALS

FOR

ELECTRIC RAILWAYS
HIGHWAY CROSSING SIGNALS



SAMSON SPOT WATERPROOFED TROLLEY CORD

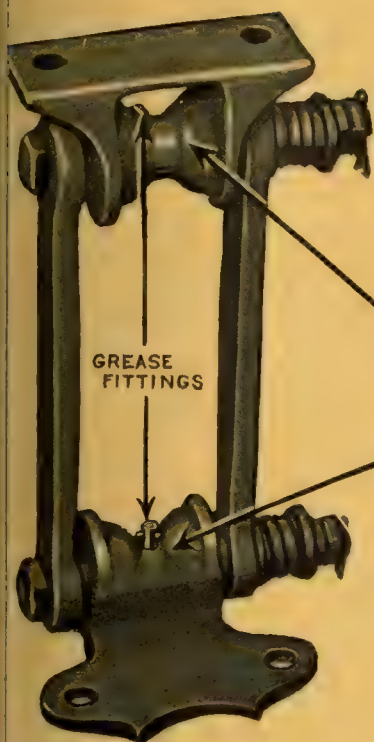


Trade Mark Reg. U. S. Pat. Off.

Made of extra quality stock firmly braided and smoothly finished
Carefully inspected and guaranteed free from flaws.
Samples and information gladly sent.

SAMSON CORDAGE WORKS, BOSTON, MASS.

Hubbard
and COMPANY
PITTSBURGH OAKLAND CHICAGO



Lubricate!



Improved service with Brill "Half-Ball" Brake Hangers Results from Introduction of Systematic Lubrication.

The importance of proper lubrication of truck parts, and its effect in noise reduction, was recently recognized in the award made to A. Taurman, Supt. of Equipment, Ways & Structures, Birmingham Electric Company, in the *Electric Railway Journal's* Maintenance Contest.

Mr. Taurman's introduction of "Alemite-ing" to Brill

"Half-Ball" Brake Hangers emphasized the necessity for increased lubrication of truck parts and presented an easy method to facilitate regularity of attention.

This system of lubrication, in addition to "Half-Ball" Brake Hangers, will also be applied to the closed bottom brake rod castings on all Brill Trucks.



THE J. G. BRILL COMPANY
PHILADELPHIA, PA.

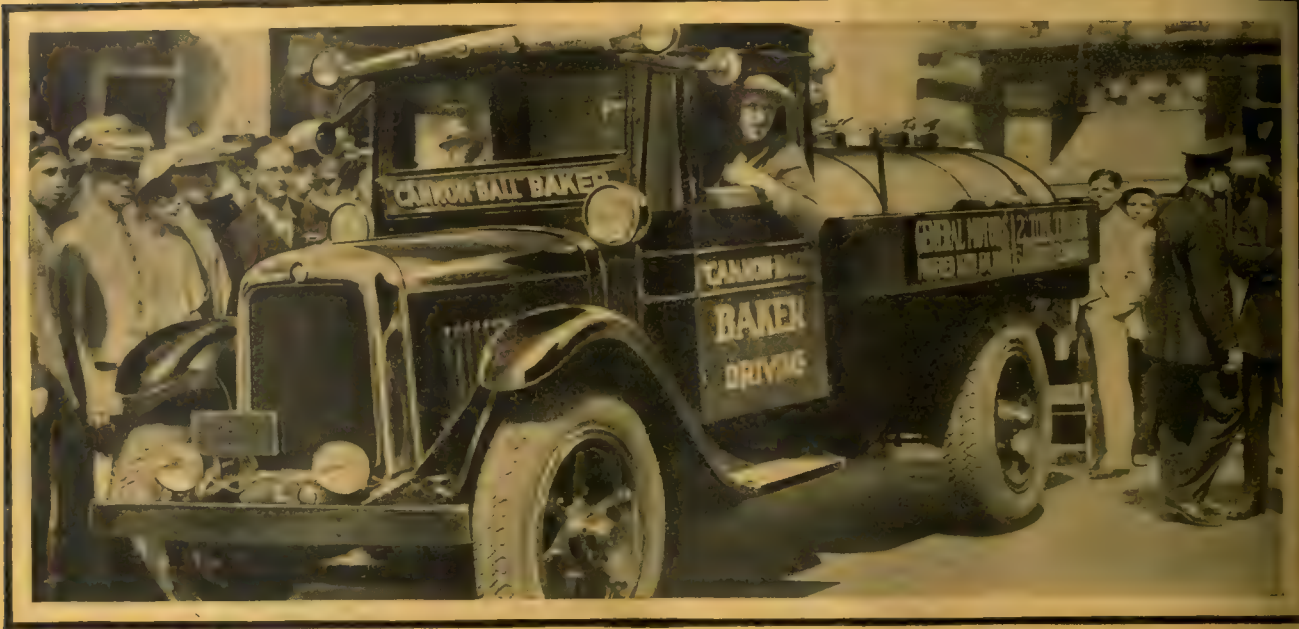


AMERICAN CAR CO. —
ST. LOUIS, MO.

G. C. KUHLMAN CAR CO. —
CLEVELAND, OHIO.

WAGON MANFG. CO. —
SPRINGFIELD, MASS.

TIMKEN WORM DRIVE HELPS SET ANOTHER RECORD



"Cannon-Ball" Baker drives General Motors 2-Ton truck with Timken Worm Drive Axle and carrying capacity load, from New York to San Francisco—3,693 miles—in 5 days, 17 hours, 36 min.

This is the axle—



and here is the newspaper account

"San Francisco, Calif., September 13.—A six-cylinder General Motors two-ton truck with capacity load and driven by Cannon-Ball Baker has set a transcontinental record between New York and San Francisco of 5 days, 17 hours and 36 minutes for the 3,693 miles, averaging 26.838 miles an hour for the entire distance.

This afternoon the truck emptied its load of Atlantic Ocean water into the Pacific.

Records were made all along the route by the truck, which is a standard two-ton, equipped with triple sealed six-cylinder Buick engine. The Cannon-Ball had no mechanical failures and made no adjustments."



[[Strength, simplicity, long life, dead silence, remarkable efficiency at sustained high speed—these factors make Timken worm-drive the ideal final drive.]]

THE TIMKEN-DETROIT AXLE CO., DETROIT, MICH.

TIMKEN AXLES

ELECTRIC RAILWAY JOURNAL

W.H. Publishing Company, Inc.

October 22, 1927

Twenty Cents per C

White Six Busses Cut 3 Hours Off Chicago-Detroit Run

IN inaugurating a de luxe high-speed bus service between Chicago and Detroit in co-ordination with electric railway transportation the Shore Line Motor Coach Company selected White six-cylinder bus equipment.

Three White six-cylinder 100-horsepower busses run between Detroit and South Bend, where connections are made with high-speed electric trains operated by the Chicago, South Shore & South Bend Railroad. There is one trip a day in each direction by "The Golden Arrow."

The Chicago-Detroit run is 284 miles, 194 miles by bus and 90 miles by electric train. The 8½-hour service cuts three hours from the present

bus running time between the two cities. The busses are equipped with toilet and washroom facilities, observation compartment and inside baggage compartment.

The selection of White Busses by the Shore Line Motor Coach Company for this important run is typical of the preference that has been given White Bus equipment by scores of electric railways and hundreds of independent operators.

THE WHITE COMPANY, *Cleveland*



WHITE BUSES

and WHITE TRUCKS



Trains operating on the runway track and main line of the Chilean State Railways at Los Chilcas.

In Chile

Thirty-Nine Electric Replace 110 Steam Locomotives

WHEN thirty-nine electric locomotives replaced 110 steam locomotives on a section of the main line of the Chilean State Railways, a new epoch in transportation in South America was written. And with electrification came new records of achievements—new records in economies, in maintenance, and locomotive performance.

The electrification extends over a distance of 116 miles between Valparaiso and Santiago and a branch line to Los Andes, a distance of 28 miles. The curvature of the entire line may be considered as of medium severity, while the grades at some points, especially the Tabon grade, is $2\frac{1}{4}$ per cent.

Under steam operation it required two locomotives 40 minutes to haul a 300-ton passenger train up the Tabon grade, a distance of 12 miles. Now one 115-ton electric locomotive takes the same train up the grade in 21 minutes. The six daily express trains have shortened their running time 50 minutes between Santiago and Valparaiso, while freight trains have increased their tonnage from 350 to 700 tons

per train. Running time along the entire line has been materially shortened.

Under steam operation, the annual cost of coal consumed amounted to \$1,447,200. The annual cost of electrical energy is \$604,800, which shows an annual saving of \$842,400 since electrification was introduced.

But the economies of electrification and lower operating costs go further. Additional reductions are shown in repairs and maintenance of locomotives; reduction of forces; eliminating coal yards and water tanks; reduction in the expense of shop power and station lighting, and the indirect economy arising from improved facilities and rapid train movements.

The Baldwin Locomotive Works
Philadelphia, Pennsylvania

Westinghouse Electric & Mfg. Company
East Pittsburgh Pennsylvania

X94915

Baldwin - Westinghouse



1927

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Vol. 70
No. 17

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Progress

PROGRESS was the dominant note which resounded at the Cleveland convention. Reports, exhibits, conferences and discussions intensified it. As the year's accomplishments were reviewed, the flame of inspiration was kindled for greater achievements.

Only through the knowledge of each baffling obstacle overcome can a true picture be gained of the progress in the electric railway industry. Each step taken in the forward movement gives inspiration to continue the advancement and to avoid retrogression. Every milestone reached along the path toward better transportation marks the passing of the old into the realm of obsolescence.

A broad survey and careful analysis of what is transpiring in the industry are of incalculable value to those engaged in it. The Cleveland convention was such a survey. In reporting it, and in continuing to report the progress of the industry, not only once each year, but every week, the JOURNAL is doing its part to speed the advance of the industry.

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Engineering News-Record

American Machinist

Power

Chemical and Metallurgical Engineering

Cost App

Coal Age News

Engineering and Mining Journal

Ingénieria Internacional

Bus Transportation

Electric Railway Journal

Electrical World

Industrial Engineering

Electrical Merchandising

Radio Retailing

Construction Methods

Electrical West

(Published in San Francisco)

American Machinist—European Edition

(Published in London)



Savings the Years Show



Because their first cost is their final cost, the economies of Davis "One-Wear" Steel Wheels roll up as the years roll by.

Where other wheels need contour conditioning, Davis "One-Wear" Steel Wheels remain in service. They save men, material and time.

And the secret of all is a special wheel steel, of special composition, heat treated to develop the unusual properties that make the Davis Steel Wheel truly "One-Wear."



AMERICAN STEEL FOUNDRIES

NEW YORK

CHICAGO

ST. LOUIS

OPERATING STATISTICS

OVERHEAD

Trolley Ears—
Marathons averaged 320,000 car passes—
Lasted three times as long as others—
Line breaks reduced from 331 to 188 per year.

LINES

Ear Replacements 75% less since using O-B Marathon Ears.
Saving in one year \$5000.00 on ears alone.

DOLLARS and SENSE!



The O-B Marathon Trolley Ear



Bottom View. Marathon Installed. Note Smooth Underrun

M

ake your statistics reflect the same savings!

Statistics of the industry as a whole reveal a split-up of the average fare as illustrated below. The net income is only 5.7%. Just one percent saved from the 69.5% now devoted to operating expenses would make the net 6.7%—an increase of nearly 20%.



VERIFYING the fact that Marathon Ears *do* last longer and make the ultimate cost for ears much less, we present the above statistics of a large city property. Do you wonder that the Line Superintendent *standardized* on Marathon Ears.

It has taken years of experience, gained in manufacturing many thousands of trolley ears of various types, carefully checked with line superintendents, to build into O-B Marathons the endurance that has made them world famous.

In addition to direct savings which help swell *the net*, every Marathon Ear on the wire is an aid in the constant effort to give street car riders prompt, speedy and delay-free service.

It is easy to figure what *you* would save in maintenance expense through their use—not so easy, what you'd gain in improved service. Either saving, however, makes it worthwhile to use Marathons.

Ohio Brass Company, Mansfield, Ohio
Dominion Insulator & Mfg. Co., Limited
Niagara Falls, Canada
704B

Ohio Brass Co.



SALES OFFICES: NEW YORK CHICAGO

PHILADELPHIA PITTSBURGH CLEVELAND
SAN FRANCISCO LOS ANGELES

PORCELAIN
INSULATORS
LINE MATERIALS
RAIL BONDS
CAR EQUIPMENT
MINING
MATERIALS
VALVES



"QUALITY MACHINES FOR QUALITY SERVICE"

The Westinghouse National

"A complete line of compressors"

N Type Compressor—12 to 60 cu. ft. displacement. Described in Publication T-2048.



WESTINGHOUSE-NATIONAL air compressors are made in a great variety of types and sizes to suit the requirements of every class of service—in factories, office buildings, newspaper plants, railway terminals, garages, quarries, mines, general construction work—or wherever a dependable supply of compressed air is required.

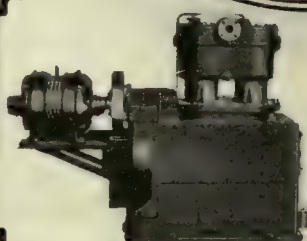
A degree of mechanical perfection that gives them a well-earned reputation for long life, dependability, and operating economy, is embodied in all compressors of the Westinghouse-National "family"—which includes steam, belt, and motor driven types, in sizes ranging from 3 to 700 cu. ft. displacement. The illustrations show several of these different types.

[Write for descriptive literature, or ask to have our representative call to consider your compressor needs and recommend the particular type suited to the purpose.]

Westinghouse Traction Brake Co.

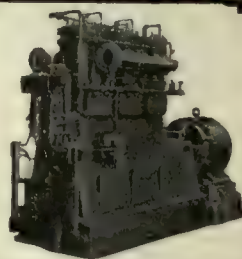
Industrial Division

General Offices and Works: Wilmerding, Pa.



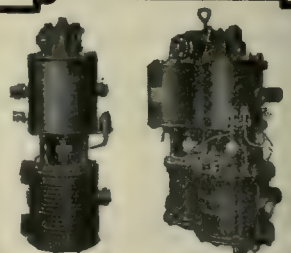
2V Type Compressor—75 to 150 cu. ft. displacement. Described in Publication T-2047.

3VS Type Compressor—208 to 468 cu. ft. displacement. Described in Publication T-2032.

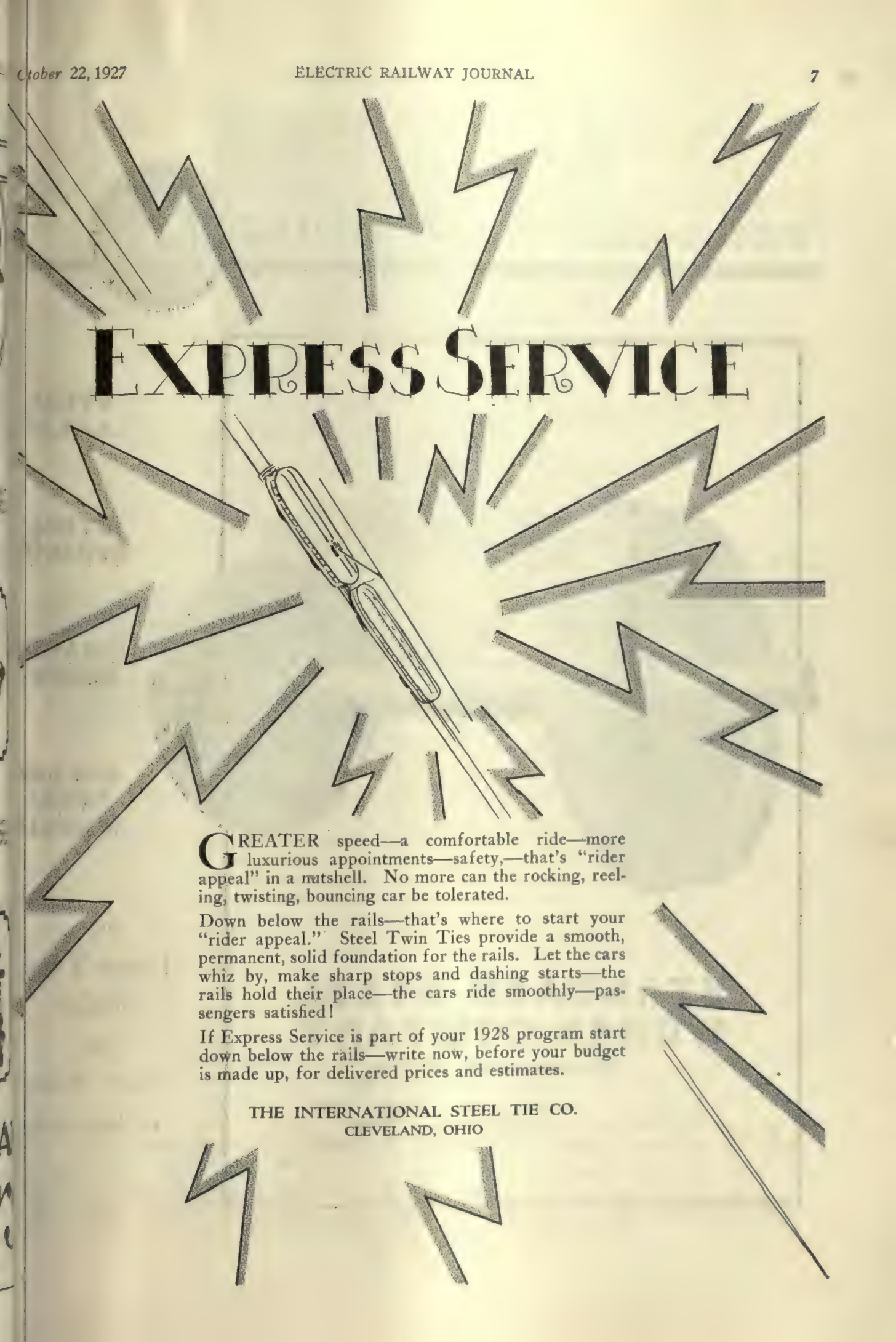


3VD Type Compressor—550 to 700 cu. ft. displacement. Described in Publication T-2032.

Steam Driven Types—35 to 150 cu. ft. displacement. Described in Publications T-2036 and T-2037.



WESTINGHOUSE-NATIONAL Air Compressors



EXPRESS SERVICE

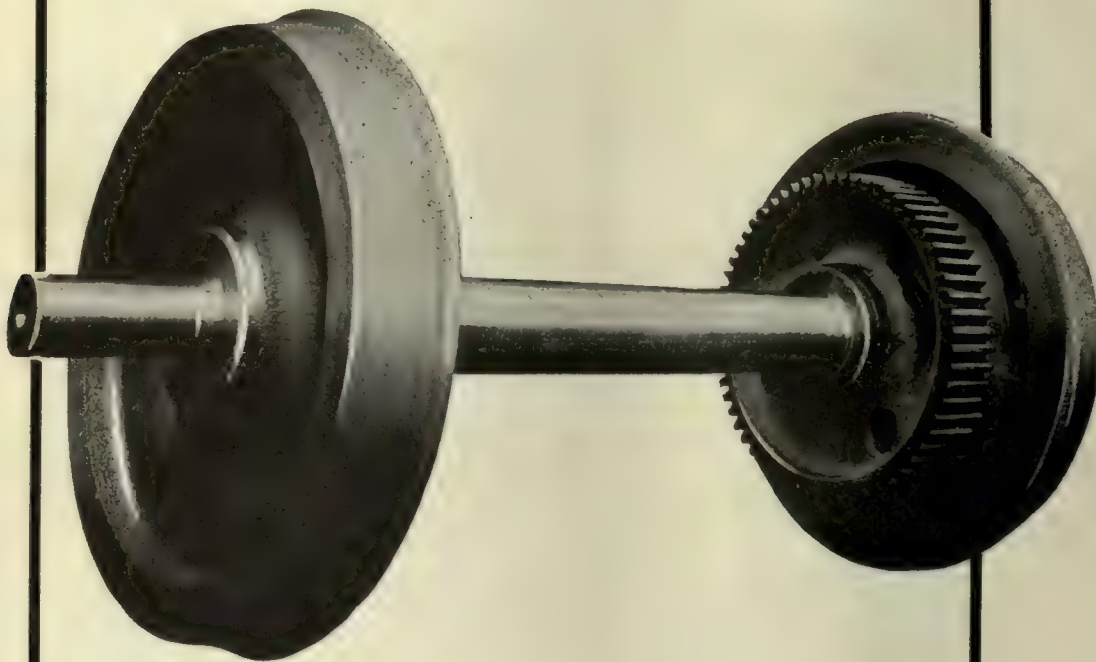
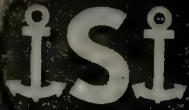
GREATER speed—a comfortable ride—more luxurious appointments—safety,—that's "rider appeal" in a nutshell. No more can the rocking, reeling, twisting, bouncing car be tolerated.

Down below the rails—that's where to start your "rider appeal." Steel Twin Ties provide a smooth, permanent, solid foundation for the rails. Let the cars whiz by, make sharp stops and dashing starts—the rails hold their place—the cars ride smoothly—passengers satisfied!

If Express Service is part of your 1928 program start down below the rails—write now, before your budget is made up, for delivered prices and estimates.

THE INTERNATIONAL STEEL TIE CO.
CLEVELAND, OHIO

"STANDARD" STEEL PARTS



**STEEL
AXLES**

**STEEL
SPRINGS**

**ARMATURE
SHAFTS**

**ROLLED
STEEL
WHEELS**

**STANDARD STEEL
WORKS COMPANY**

Philadelphia, Pa.

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ST. LOUIS
NEW YORK

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HOUSTON
PORTLAND
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MEXICO CITY

SAN FRANCISCO
ST. PAUL
PITTSBURGH

WORKS: BURNHAM, PA.

for
Every Type
of Car
in
Every Kind
of Service



Dome Type Fixtures

Enhance the Appearance of Your Car Interiors

Interior lighting of modern cars by means of dome type fixtures has become exceedingly popular. It reflects the present trend toward improving the comfort and appearance of electric cars so that they may equal the de luxe service offered in many cases by competing vehicles.

These Dome Type Lighting Fixtures are designed to provide well diffused light and to prevent any glare and consequent eye strain to passengers. They are also substantially made to withstand extreme vibration.

Let us explain to you how our new and interesting wiring plans can be adapted to your requirements.

Home office and plant at 17th & Cambria Sts., PHILADELPHIA; District offices at 230 So. Clark St., CHICAGO; 50 Church St., NEW YORK; Bessemer Bldg., Pittsburgh; 88 Broad St., Boston; General Motors Bldg., Detroit; 316 N. Washington Ave., Scranton; Canadian Agents, Lyman Tube & Supply Company, Ltd., Montreal, Toronto, Vancouver.

ELECTRIC SERVICE SUPPLIES Co.

MANUFACTURER OF RAILWAY, POWER

AND INDUSTRIAL ELECTRICAL MATERIAL





Giving Impetus to Transportation Service

SPEEDY transportation is vital to present-day conditions. Car riders want it; car owners need it.

What factors contribute toward the attainment of this objective?

Short headway between cars to reduce waiting time of patrons.

Quick application of brakes to reduce time consumed in making a stop.

Rapid interchange of passengers to cut down the standing time.

Prompt release of brakes to permit a quick get-away.

How may these factors be efficiently combined while retaining the basic element of safety?

The answer is—Safety Car Control Equipment. It brings economic advantages that warrant additional cars. It assures the quickest possible brake action. It provides the maximum convenience and flexibility in controlling entrance and exit. It safeguards operation by interlocking power, brakes, and doors, and by centralizing responsibility.

Safety Cars are giving a noteworthy impetus to transportation service.



SAFETY CAR DEVICES CO.

OF ST. LOUIS, MO.

Postal and Telegraphic Address:
WILMERDING, PA.

CHICAGO SAN FRANCISCO NEW YORK WASHINGTON PITTSBURGH

*We make the Safety Car Devices
 which make the Safety Car.*



It paid this operator
to "make the
setting count"

There was a perfectly good chassis. But it needed a new setting,—a new and up-to-date body,—to restore its revenue-building power.

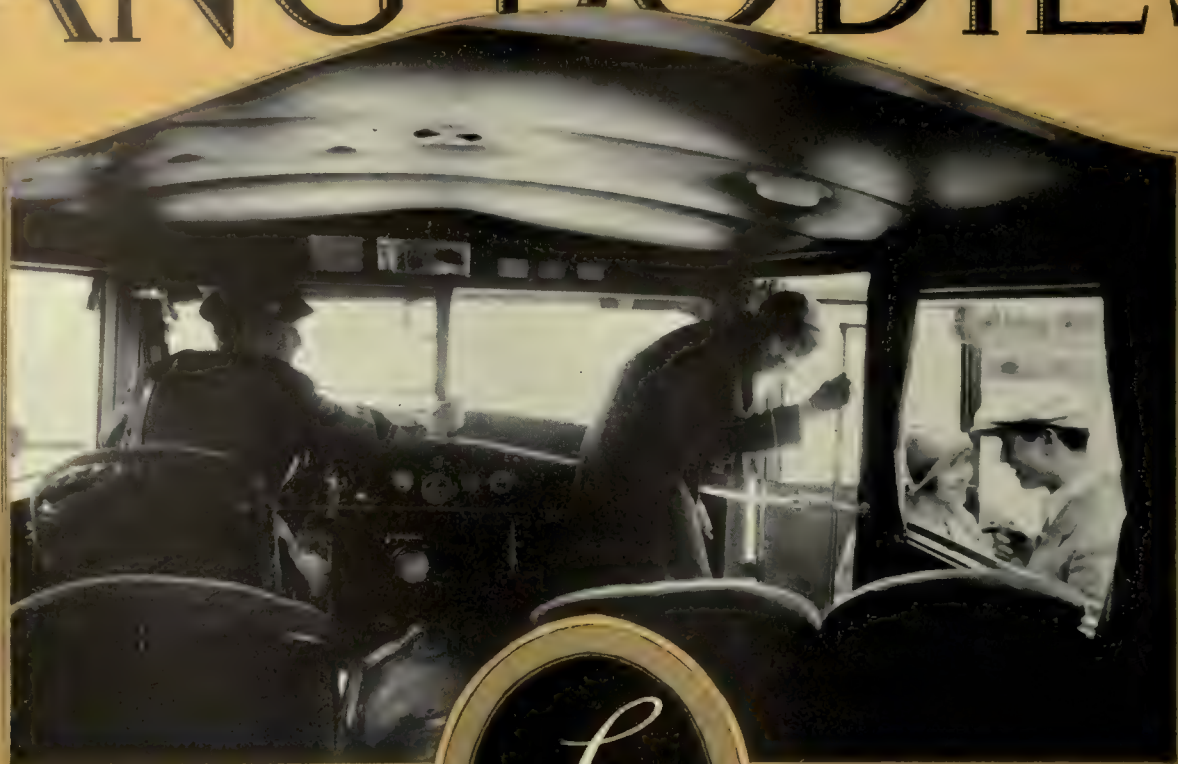
Lang Craftsmen have made a thorough study of such problems. Thus they have built a body exactly in tune with today's demands on this operator,—fine in line, luxurious in appointments, sturdy and practical in every detail. No one would know that the chassis was of any but the latest type.

After all it is the setting that counts.



... *Lang* has a ...
special department for
body maintenance

LANG BODIES



LANG BODIES create passengers—friendly passengers who ride often and tell others of the comfort enjoyed.

Every detail of luxury, that contributes to the enjoyment of riding, is carefully planned with an eye to building revenue. Every mechanical feature of construction is designed to assure economy and long life. Lang Bodies, "Pullmans of the Road," are built by master craftsmen.

THE LANG BODY COMPANY, CLEVELAND, OHIO

*After all—
it's the Setting
that counts!*



TEXAS



NP

A Tripled Use of Treadles

Fort Worth has proved the worth of NP Treadle Exit Doors. The first ten cars were equipped with treadles in this city little more than a year ago. This number has been now increased to thirty-five—a tripled use of treadles which confirms and parallels the satisfaction and experience of users in some sixty other cities.

NATIONAL PNEUMATIC COMPANY

Executive Office: Graybar Building, New York

General Works: Rahway, New Jersey

CHICAGO
518 McCormick Building

MANUFACTURED IN TORONTO, CANADA, BY
Railway & Power Engineering Corp., Ltd.

PHILADELPHIA
1010 Colonial Trust Building



JUST as the electric railway companies have to compile and be guided by exhaustive statistics as to peak loads, traffic densities, costs per mile, and so forth, we must constantly keep ourselves informed as to purchasing power, density of population and all vital market information in order to maintain our service as an active asset of your service.



Barron G. Collier

INCORPORATED

CANDLER BLDG. NEW YORK

Wet, dry or greasy



On July 20, 1926, a double-truck car of the Buffalo & Erie Railway, equipped with the *Duplex Air and Magnetic Brakes*, was tested for emergency stops from a speed of 44 m.p.h. on a 700-ft. section of greased track.

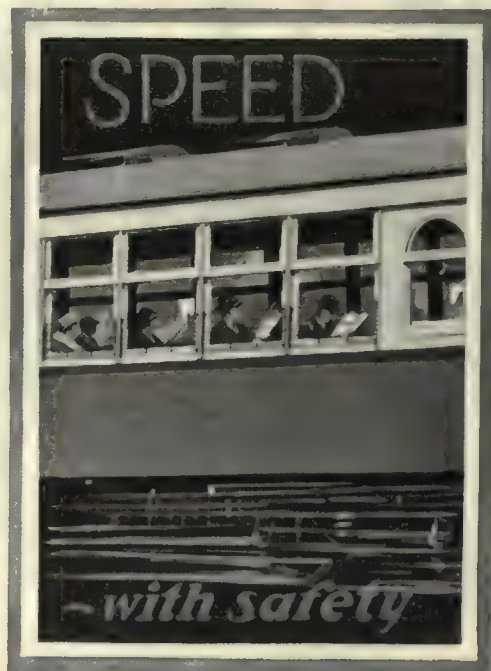
With both air and magnetic equipment operating it stopped on the greased section in 470 ft.

With air alone it ran through the greased section and 85 feet onto dry track before stopping.

Pretty strong evidence of magnetic braking efficiency under adverse track conditions!

Technical data on request.

Cincinnati Car Company
Cincinnati, Ohio



CINCINNATI

BALANCED
LIGHTWEIGHT

CARS



A YELLOW

Quietness and easy riding that steadily builds passenger revenue.

A degree of mechanical perfection that reduces maintenance and keeps the coach in service.

Transportation experience behind the vehicle that influenced its design and makes possible its low-cost, profitable mileage.

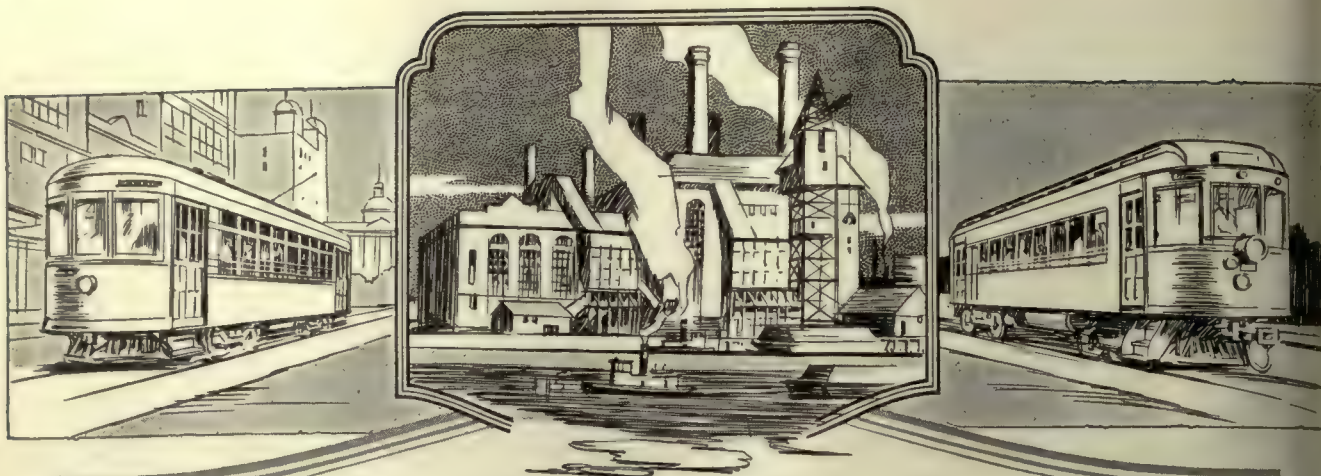
Repeat orders for the first six months of this year constituted 92% of all Yellow Coach sales to Utilities.

Satisfaction on the part of operators and patrons arising from dependable and economical operation.

YELLOW TRUCK & COACH MANUFACTURING CO.
SUBSIDIARY GENERAL MOTORS CORPORATION
5801 WEST DICKENS AVENUE, CHICAGO, ILL.

YELLOW COACH

A General Motors Product



OCTOBER— an *Important* month to Lubricating Engineers

—and this is why:—

Each year, at this time, Electric Street Railways have to meet certain operating conditions which have a seasonable phase.

Being in the Oil business, *we'll stick to that* end of it.

That is why we impress upon you that now is the time to begin changing your lubricants to meet weather conditions.

There is a good reason for this:

All oils tend to become a little thicker, a little sluggish, in colder weather.

The viscosity (fluidity or body) of all oils varies with temperature. In the application of lubricants to street cars it is the operating temperature that counts. As the weather gets colder, the oils you used all summer will thicken. They will not feed as freely. You can't change the temperature, but you can *change the oils* to compensate.

But weather doesn't change at a given date, so here's what we recommend:

Compensate gradually. Begin now (about the middle of October) adding steadily small

quantities of lighter oils to the lubricants now on the cars. This will gradually lower the viscosity, keeping it normal all the time as winter comes.

Begin now, changing over to

TEXACO WINTER ELECTRIC CAR OIL
TEXACO WINTER AIR COMPRESSOR OIL
TEXACO WINTER GEAR LUBRICANT

Then all the time, even in the middle of winter, you will be fully protected by these carefully refined lubricants.*

We have worked out an interesting and economical technique on roads all over the country and shall consider it a privilege to have our TEXACO Lubrication Engineers discuss it with you in person.

As our stations are already stocked with the Winter Lubricants, we are amply prepared to handle your order for them now.

And remember, there is a TEXACO Lubricant for every purpose; for rolling stock or power plant—everywhere along the line.

*In spring, reverse the Process, gradually raising the initial viscosity of the lubricants so that, under the heat of summer, the oils will "fall back" to their original fluidity.



THE TEXAS COMPANY

Texaco Petroleum Products

17 BATTERY PLACE, NEW YORK CITY

DEPT. EX

OFFICES IN PRINCIPAL CITIES



Last Week

An announcement of the Coffin award to the Grand Rapids Railway Company—in which St. Louis Cars played a conspicuous part.



This Week

In recognition of the accomplishments of Grand Rapids

Not spectacular in the usual sense of the word—but an outstanding achievement in increasing the advantages of electric railway transportation for the well-being of the public and the benefit of the industry.

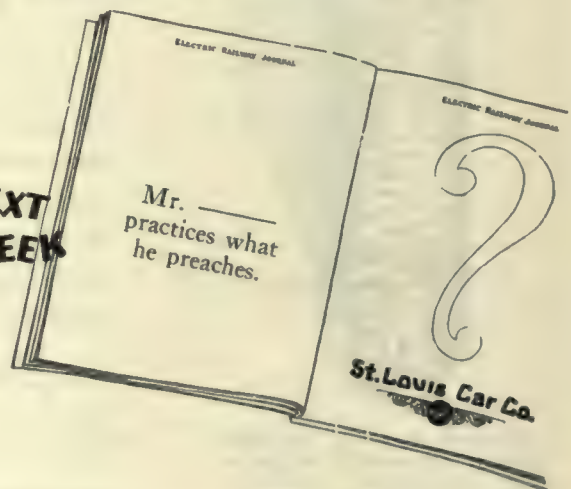
These facts based on the following operating figures won the Coffin Award for Grand Rapids.

For the year ending May 31st, 1927, operating costs were reduced 9.88% and net revenue increased 20.83% over the year of 1926.

After charging off depreciation amounting to approximately 10% of its gross, there was available a balance equal to 6.40% of its rate base of \$6,000,000—an increase of 41.68% over the corresponding period of 1926. And this figure for 1926 was 15.63% better than for 1925.

Small wonder that the industry honors its debt to Grand Rapids. Small wonder, too, that the Quality Shops is entirely satisfied to stand in the reflected glory for the part St. Louis Cars played in electric railway operating history for Grand Rapids!

**NEXT
WEEK**



St. Louis Car Co.





The G-E Railway Supplies Catalog lists many items necessary for railway equipment maintenance. Use your catalog to simplify your buying.

Self-aligning fingers for better control

The new G-E hinged-type controller finger practically eliminates trouble due to broken and bent fingers. Contact pressure is maintained by means of a rigid hinged arm and a spiral steel spring.

The arm which carries the tip is made of steel and will not break or bend under the most severe operating conditions. The hinge end seats and rocks on a steel tongue narrow enough to allow full-width contact through the alignment of tip and segment. This feature reduces heating and burning of both segments and tips and greatly prolongs their life.

This finger is equipped with a removable tip. By replacing only the worn tips, practical economies are effected in controller maintenance.

*Specify G-E hinged-type fingers
for all finger replacements.*

GENERAL ELECTRIC

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Occasion for Justifiable Pride

SOME of the practices and the results accomplished by the track and electrical departments of the Chicago Surface Lines, as presented by that company in its brief for the 1927 Coffin Award, are outlined in an article in this issue. Other phases of the property's accomplishments will be published in subsequent issues. These records speak for themselves. But in interpreting the performance of this largest street railway in the world several pertinent factors should be borne in mind.

First of all, labor rates in Chicago are as high as in any city in the country. That condition is not peculiar to transportation labor, but is attributable, at least in large part, to the generally high level of rates paid by various industries in the city. Consequently, the management has faced not with a theory but with a condition over which it had little control; that is, it had little opportunity for initiative in determining the prevailing level of labor rates. It did, however, have control over the facilities which directly affect the productivity of labor. The cost per man-hour was fixed by conditions in the community, but the number of man-hours per job was partly in the hands of the management.

So it is to the record of unit costs that we must look for a measure of efficiency. There will be found figures that show up very favorably with comparable properties in other cities. Not only is this important fact made clear in the company's presentation, but the reason is quickly evident. In Chicago machines are cheaper than men, and so on every hand is found the substitution of machine for hand labor.

There is a deeper significance in all this. Even nominal foresight on the part of the management would dictate adoption of machinery by an enterprise whose future was clearly mapped. Such, however, was not the situation of the Chicago Surface Lines. The franchises expired in February, 1927. Since that date the property has been operated under temporary grants, and one of the constituent companies is in technical receivership.

Not only in the figures themselves, but in the conditions under which they were recorded, lies the true measure of Chicago's accomplishments. Machinery calls for capital and to get capital requires credit. It is one thing to put money into an enterprise which is promising, but it requires an entirely different quality of foresight and courage when no bridge is visible over troubled waters.

Chicago turned hard cash into more cars, new and rebuilt track, more efficient substations and maintenance machinery to keep these facilities at the highest possible standard of efficiency, despite costly labor and an uncertain future. In no city of the country has there ever been like demonstration, on such a scale, of faith in the fundamental need for street railway transportation, in

the ultimate judgment of the American people toward a transportation management or in the power of demonstrated efficiency to win a square deal for invested capital. In most cities the approach of such a franchise condition as now exists in Chicago has been accompanied by physical deterioration and operating lassitude.

There is strong evidence that the full significance of the Surface Lines management's performance during the past several years is gradually penetrating the public consciousness in that city. When an equitable franchise settlement is reached—such a result seems inevitable if the present policy is continued—there will have been written what is perhaps the most glorious chapter in all recent local transportation history.

What the Maintenance Contest Teaches

GOING over the many items submitted in ELECTRIC RAILWAY JOURNAL'S Maintenance Contest one is impressed particularly by the large variety of problems with which electric railway maintenance departments are confronted. The articles show an earnest desire on the part of the men who submitted them to lower maintenance costs, to provide more efficient and better methods, to eliminate fatiguing operations and manual labor, to overcome troubles experienced in the various operations and to provide improved equipment to do the work.

Sometimes shop-constructed equipment is employed which might be considered crude, but time and labor are saved by using it and the need for improved equipment of this character is demonstrated. There are two reasons why this equipment is built in electric railway shops. First, few devices such as are needed for these special operations are available ready built by the manufacturers. Secondly, the railway has the material and labor necessary for making these, and managers frown on authorizing necessary appropriations for new and untried equipment while the shop forces can build such devices as will satisfy them and charge the cost to maintenance.

Frequently, after apparatus designed and built in the shop to serve a specific purpose has been given a tryout and changes that experience shows are necessary have been made, the improved device may be put on the market in commercial form by a manufacturer.

Another lesson learned from a study of the material submitted in this contest is that there is particular need for the interchange of ideas among maintenance men and the adoption on each property of the more progressive methods and equipment that are found of value on other railways. There seems to be a hesitancy on the part of some to use a method because it originated elsewhere, or, on the other hand, to broadcast their own methods that have been found of particular value. Much good will result from a free interchange of ideas.

This is the issue in October that is devoted essentially to maintenance and construction subjects

Good Cars Deserve Good Track

WITH the trend toward better accomplishment in railroad operation one item is receiving too little consideration—the track. Strenuous effort is being made to improve public relations through the use of better appearing and riding cars and other means of sales appeal. But, alas, the track is down in the dirt and in a fair way to be overlooked or given scant attention. It requires no detailed analysis or proof to show that this is short-sighted, and particularly so for the interurban railway. A rough track shakes a good car to pieces and even a good car makes the bad track still worse.

Aside from the mechanics of the problem, which determines cost, rough track drives away the passenger. Instances can be cited without number to prove this, but the following is typical. An executive of a large city system has occasion to use an interurban road to another large city and the necessary pass to permit his free use of the electric line. This system is well equipped with the most modern of cars, which would furnish a most enjoyable ride were it not for a rough track. This executive, rather than submit to the rough-riding track, takes the steam train and pays his fare. If the electric railways cannot sell their wares to members of their own fraternity, how can they hope to stimulate public patronage? There is nothing more terrifying than a high-speed interurban car lurching from side to side.

An Engineering Accomplishment in Tongue Switch Design

EMPHATIC approval of the recommended design for a standard solid manganese steel tongue switch registered by way engineers at the round-table luncheon held in Cleveland during the convention serves particularly well to illustrate the successful working of the new method of conducting Engineering Association studies through special committees, which was commented on in an editorial last week.

To those versed in Engineering Association affairs a near-miracle has come to pass. Five years ago no way engineer would have ventured to hope that such a standard could be adopted, but the special committee, in securing agreement among both manufacturers and users on the details of such an important piece of track mechanism, has accomplished just that object after only three years.

It is doubtful if a large committee constituted as the way committee was formerly, with nearly 30 members, could have done this in so short a time, and the immediate approval of the new design gives good evidence of the value of the special committee method for the study of highly specialized subjects and emphasizes the merit of the important change in conduct of Engineering Association committee work begun during the year 1925-26.

What a standard tongue switch design means to the industry is readily apparent to executives as well as engineers, and the display at the convention of an actual switch made to the new design was a stroke of good business. Every one could see what was being talked about. The luncheon discussion of the switch was another piece of good management. It seemed to interest the engineers who should use the switch in the need for actual purchase and use under traffic tests which are necessary to develop the value of the several novel features found in the new design.

The special committee responsible for the design deserves great credit for its work. It remains for execu-

tives and way engineers generally to do their part in making test installations, thus assisting the committee and showing appreciation of its efforts to aid in securing further economy in operation which should result from this important piece of standardization work.

Time Saving Important Factor in Reducing Maintenance Costs

LONG hours of labor were the rule in repair shops of yesterday, the wages paid workmen were small and raw material was low in price. These economic factors permitted the use of cut-and-try methods of repair, which did not serve to awaken the human consciousness to the great importance and value of time.

Much old equipment is still in use today. Work done by it may be quite well finished, but when checked with the economical production resulting from use of up-to-date equipment, the time taken is astonishing. In these prehistoric shops it is quite usual to find an obsolete motor running the entire system of shafting. If it is necessary to drill only a $\frac{1}{4}$ -in. hole, the whole plant must be set in motion so that the drill press may run. Compare this arrangement with some of the modern shops, where each tool is driven individually and where no energy is wasted to drive machines not in actual use.

Time saving of today does not include alone machine tool design or methods of installation and drive. In modern shops much is being done to promote the required efficiency through the use of special appliances, jigs and fixtures. The parts when completed or repaired with the assistance of these devices have longer life because of greater accuracy and precision in manufacture. Such fixtures also make possible interchangeability of machined parts, with resultant saving in installation.

Jigs and special fixtures frequently reduce the time and energy required for repairing car parts by more than 75 per cent of that used but a short period ago. The use of this improved equipment has made possible the carrying out of many repairs to parts where previously they were replaced by new ones. The worn parts were scrapped indiscriminately, and the new ones were put in without particular thought of the cost of the material or the wastefulness of such a procedure. Now many railways have reclamation departments, so that the parts removed are sent to these and they are so reconditioned as to again be able to serve as well as the new parts.

The effect of the maintenance department's performance on reliability of service and upon the condition in which the passenger finds equipment is most marked. The very life of electric railway service depends on its reliability. Interruptions of service due to failures of equipment, track or line are a serious detriment to the reputation of any company and to any railway organization. It takes but few such interruptions to put the company in a bad light in the eyes of the public and its patrons. In addition, maintenance forces play an important part in fixing the expenses of operation. In proportion as the performance of maintenance forces increases or decreases, operating expenses increase and decrease, and these have a marked effect on the margin of resources that the management has available for the improvement of service to the public. Officials must give increased attention to maintenance methods. One of the least expensive improvements that can be made is to provide special tools and fixtures for doing the work so that it can be carried out more efficiently and so that the parts, when repaired, will be of the highest type.

Absentees from Formal Discussion Detract from Value of Meetings

EFFORTS made by the program committees of the various associations to arrange well-balanced meetings are defeated if men who promise to participate in the discussion fail to appear. This year a special endeavor was made to liven up the proceedings by reducing to a minimum the time spent reading formal reports. It was thought that this time could be spent more profitably in numerous short discussions in which transportation men from all over the country could give their views. That this plan is a good one was clearly shown by the very interest evinced by the delegates in the discussion. But there was not enough of it. The chairmen called on man after man listed on the program without response. Of 40 men scheduled to discuss various topics at the sessions of one of the affiliated associations only fifteen appeared. Eight were represented by substitutes and seventeen failed to participate in any way. From this sorry showing it is evident that those who have promised to discuss committee reports need to be aroused to a keener appreciation of their responsibilities. It might be well for next year's program committees to make note of this while the recollection of it is fresh, in order that it shall not be repeated at the 1928 convention.

Putting Line Maintenance on a Business Basis

DISCUSSION of trolley wire failures has been avoided in some quarters, like a plague or a hidden sin, although the resulting delay is very evident and can only give the public a more unfavorable impression of street car service. Each break is spectacular to a degree, and stands out to patrons of the road like an advertisement of non-reliability. From an economic standpoint, each break is extremely costly in car delay, loss of revenue and accident contingency.

However, despite the lack of publicity, overhead maintenance on many properties has advanced to such a point that the familiar cry of "trolley down" and the thrilling flash of the emergency crew to the scene is now a rare occurrence. On these roads preventable wire breaks do not exist, because the wire is repaired before the breaking point is reached.

To the mind of the operator of each road, the overhead plant resolves itself into the contact wire alone. Some managements judge efficiency of the line department only by the rapidity with which breaks can be repaired. Little or no cognizance is taken by them of the number of failures, their causes and the car mileage operated. A better way of judging efficiency in respect to trolley wire breaks should be by the number of preventable breaks in direct ratio to the number of car-miles traveled. Certain data make it seem that this figure should be in the neighborhood of one failure for every 1,000,000 car-miles traveled. With this figure or the A.E.R.E.A. suggested average of 0.5 break per single-track mile as a basis of comparison operators can readily compare the efficiency of their overhead plant.

Many properties are now establishing records for uninterrupted service which were thought impossible a few years ago. These roads have lowered their trolley breaks to such a point that practically all that occur are due to agencies beyond the control of the overhead department. It is surprising to note that these results are being obtained at less total cost than with the "rush out and pick up" method.

What is possible on these properties is possible on all. The speed of the emergency crew must surrender to the accuracy of frequent inspection and adequate renewals, and thus lay the bogey of the trolley down to rest with the other "it can't be done's."

Raising Safety to a Major Factor in Industry

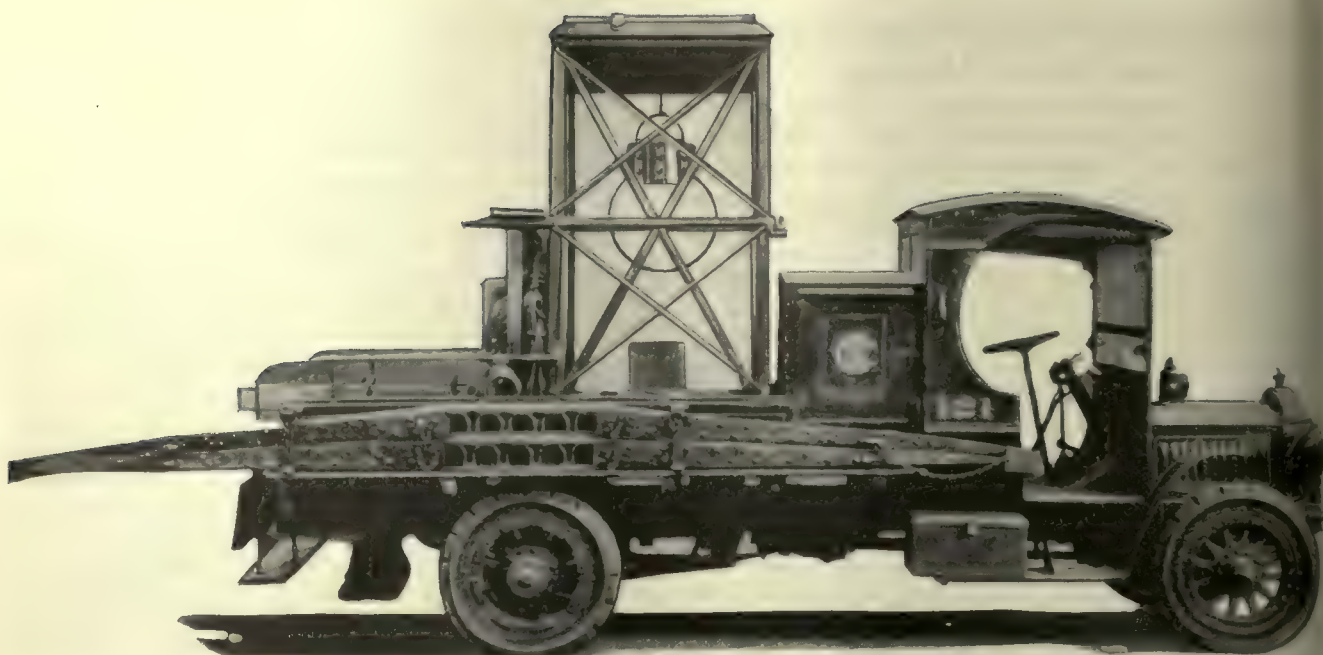
HIGH production and most efficient operation can be secured only through the elimination of accidents and their resulting costs, says a committee of the American Engineering Council, which for more than a year has been making an exhaustive study of nation-wide safety and production. As the result of representation by the National Bureau of Casualty and Surety Underwriters, by which it was financed, a study was made of twenty industries and 60 productive groups, based upon an experience of over 50,000,000,000 man-hours. Thirty-six local committees comprising 230 engineers in all parts of the country participated. Out of their investigation came the undeniable slogan, "The safe factory is the efficient factory, and the efficient factory is the safe factory."

The report contains thirteen detailed findings built up from data covering 13,898 companies, 122,028 company-years, 2,454,413 employees, 13,143,569 man-years, and 54,430,707,000 man-hours.

From these data there have been deduced several axioms, among them: (1) Maximum productivity is dependent on the reduction of accidents to an irreducible minimum; (2) there is such a close relationship between safety and production that it is impossible for a plant to have continued increase in productivity unless at the same time it reduces its accident rate; (3) individual companies report that material reduction in accident rates can be obtained simultaneously with increase in production rates; (4) the rate of production per man-hour for the industrial groups studied was 13.4 per cent higher in 1925 than in 1922; (5) prior to this the rate of accident frequency per man-hour was 10.4 per cent lower in 1925 than in 1922; (6) accident prevention and performance in the past in each industry shows tremendous improvement, and similar results can be achieved by the remaining plants in each industry. Also, a great many do not analyze or even keep proper records.

Perhaps the most significant statement in the entire report is as follows: "The dynamic force which can obtain this highly desired objective has but one source: it resides in the management. Therefore, a responsibility that cannot be evaded rests on the managers and executives of industry to make safety a major interest and a controlling care. Here is the crux of the entire safety movement and one that has been lost sight of due to faulty methods of applying the safety program. The JOURNAL has stressed this point and would stress it again: No employee is going to respect the safety program when he is conscious that his employer does not. Safety cannot be assimilated in piecemeal. It must be a steady and consistent diet strictly adhered to by everyone, from the president to the office boy.

In fixing the responsibility for higher production and more efficient operation the American Engineering Council committee has called a spade a spade, something which should have been done in the safety field of engineering industries long ago. By its recommendations and its findings this committee has raised safety to a major factor in American industry.



Wrecking truck used by Chicago Surface Lines, showing method of carrying fire hose bridges. These trucks are of 3 to 3½ tons capacity

Track and Power Efficiency Increased in Chicago

BOTH the track and electrical departments of the Chicago Surface Lines have been called upon to show a constantly increasing efficiency in order to meet that company's program of improved service and reduced costs while at the same time paying the highest wages, both for skilled and unskilled labor, of any property in the industry. The record of how this result has been accomplished, as revealed in the company's brief filed in the 1927 Coffin Award contest, is one of systematically reducing expensive hand labor to a minimum. At the same time, the company's policy of increasing and improving service in the face of expiring franchises that prevented the acquirement of new capital has taxed the ingenuity of both track and electrical forces to keep up with the constant demand for greater utilization of existing facilities.

The substitution of machine for hand labor has played an important part in increasing the efficiency of the track forces of the Chicago Surface Lines. Equipment of this department includes two sizes of air compressors, the larger unit with a capacity of 360 cu.ft. operating four concrete breakers or eight tie tampers, and the smaller machine capable of operating four tie tampers or two concrete breakers. Drake continuous mixers and those of the Chicago type, both mounted on trucks, are used for large concrete jobs. For smaller projects mixer-mobiles propelled by the engine of a 1-ton truck are used.

Chicago Surface Lines reveals in its brief filed in the Charles A. Coffin contest some of the methods and practices that have enabled the track and electrical departments of the company to hold down costs in the face of high labor and material prices

Concrete materials are handled by bucket loaders. Rotary grinders of the Atlas type, rated at 7 hp., take care of electric seam-welded joints and electric welds on special trackwork, both manganese and high carbon. Vulcan type reciprocating grinders are used for thermit welds, and electric hand grinders for the

throat ways of manganese mates and frogs where one run is used more than another. The hand grinders are particularly valuable for use on emergency curves in the downtown district. Rail corrugations are removed with six Kerwin grinder cars. For straight trackwork, electric boring and spike-driving machines are employed. Duntley track drills are used for tie-rod and fish-plate holes.

For maintenance work, an asphalt road repair outfit has been found to be of great assistance, not only for the specific duty for which it is designed but for heating concrete materials during winter work. The company also has a number of Differential dump cars and flat cars, the latter equipped for unloading ballast with air-operated sliding trapdoors.

Special attention has been given by the track department to switch protection. There are on the system 2,074 trailing switches, of which 179 are protected. Protection is divided into four styles: Electric, lever (a Chicago Surface Lines product), spring and tongue-holding devices for paved streets, and the standard ground throw and high stand type for open track. In 1924 only 7.08 per cent

derailments were due to track imperfections. In 1925 and 1926 there was a further reduction of 6.05 and 5.83 per cent respectively.

In the matter of welding thermit joints, the Chicago Surface Lines has some interesting figures to show. It has been possible to weld approximately 2,200 joints without a single runout, more than 400 per cent more joints than experts declare can be expected. Competent supervision before the process starts has resulted in obtaining 190 joints to each crucible lining. Electric seam welds with the carbon arc process, used to salvage broken electric or cast welds, have been employed with great success and without interfering with operation.

Due to the use of power machinery in maintenance of way, the labor cost and productivity show relative reductions and increases. On the basis of wages in 1921 being nearly 346 per cent over the 1913 scale and labor cost 330 per cent increased over 1913, the company found in 1926 by the introduction of power machinery that while labor rates had only decreased to 325 per cent over the 1913 scale unit labor costs had dropped to 238 per cent of the 1913 figures.

Eighty-six per cent of the track paving in Chicago is of 15-in. granite blocks from 7½ to 15 in., depending upon rail heights. In addition, 18 miles of 19-in. concrete paving has been laid, the rails being flanked by granite blocks.

Power for the 1,080 miles of track in Chicago is supplied through seventeen modern substations. Some idea of the power problem may be gained from the fact that the maximum hourly system loads show an increase from 124,400 kw. in 1920 to 151,800 kw. in 1926. Although this is an increase of 22 per cent it has only necessitated increasing the substation capacity by 3½ per cent. Recent figures compiled during the Christmas peak of last year revealed that the maximum hourly load on the system was 3.5 per cent above its rated capacity. During this period one substation carried an hourly overload of 40.3 per cent.

Many factors enter into this record of the electrical department. To begin with, the thermal capacity of the machines has been increased by replacing with mica tape



Modern type of concrete paving on Michigan Avenue at 126th Street in Chicago. The rail was installed in 1912 and 1913. Paving was placed in 1924

the old-style fabric armature insulation on the synchronous converters. Perfect commutation has been secured by undercutting the commutators, and the air-blast transformers have been rebuilt to increase the amount of air circulation.

In line with its determination to insure a reliable power supply at minimum cost the management installed an automatic railway substation in October, 1926. This station, located in the northwest part of Chicago, is equipped with two 2,000-kw., 600-volt, 60-cycle, six-phase, compound-wound commutating pole synchronous converters that are supplied by outdoor power transformers. There is supervisory control equipment in the station that enables the operator in the nearest manually operated station to control both units and all direct-current feeders.

Experience has shown a 20 per cent reduction in the cost of maintenance and operation per kilowatt-hour converted in this type of station as compared with a manual substation of like capacity. Among other things the station includes a natural ventilating system developed by the company's men. While on this subject it is interest-



Precautions taken by Chicago Surface Lines to protect track workmen in the streets. The simple safety gate blocks the work area effectively



Barber-Greene bucket loader, in combination with a Drake continuous mixer, speeds concrete work in the Chicago track department

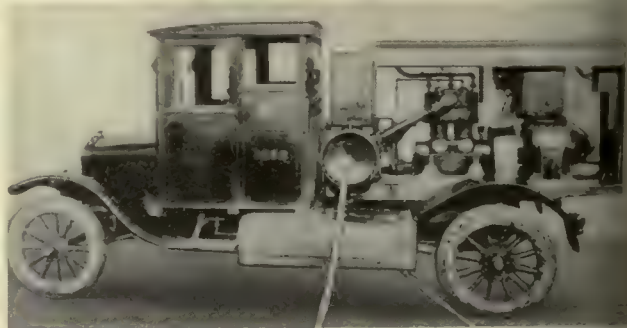
ing to note that there has been a decrease of 11.4 per cent in the cost per kilowatt-hour for substation employees during the past five years, this in face of an increase in the wage scale. Cost data on materials and supplies indicate a decrease of 23.1 per cent between 1920 and 1926.

The installation of Economy meters on passenger equipment and the creation of a car meter division, which were decided upon in 1924, have brought about a marked saving in energy, represented by a 7.6 per cent gross decrease in energy consumption per car-mile measured at the car. The company points out that there is an additional saving which is not shown by this figure, due to the operation of more cars at a greater speed and that they carry more passengers than in 1924. Included in the organization of the car meter division are twelve supervising motormen who act as energy-saving instructors for the system's twelve transportation districts. These men, through the medium of accurate records of the meter readings for all motormen, are able to segregate the inefficient operators for the purpose of giving

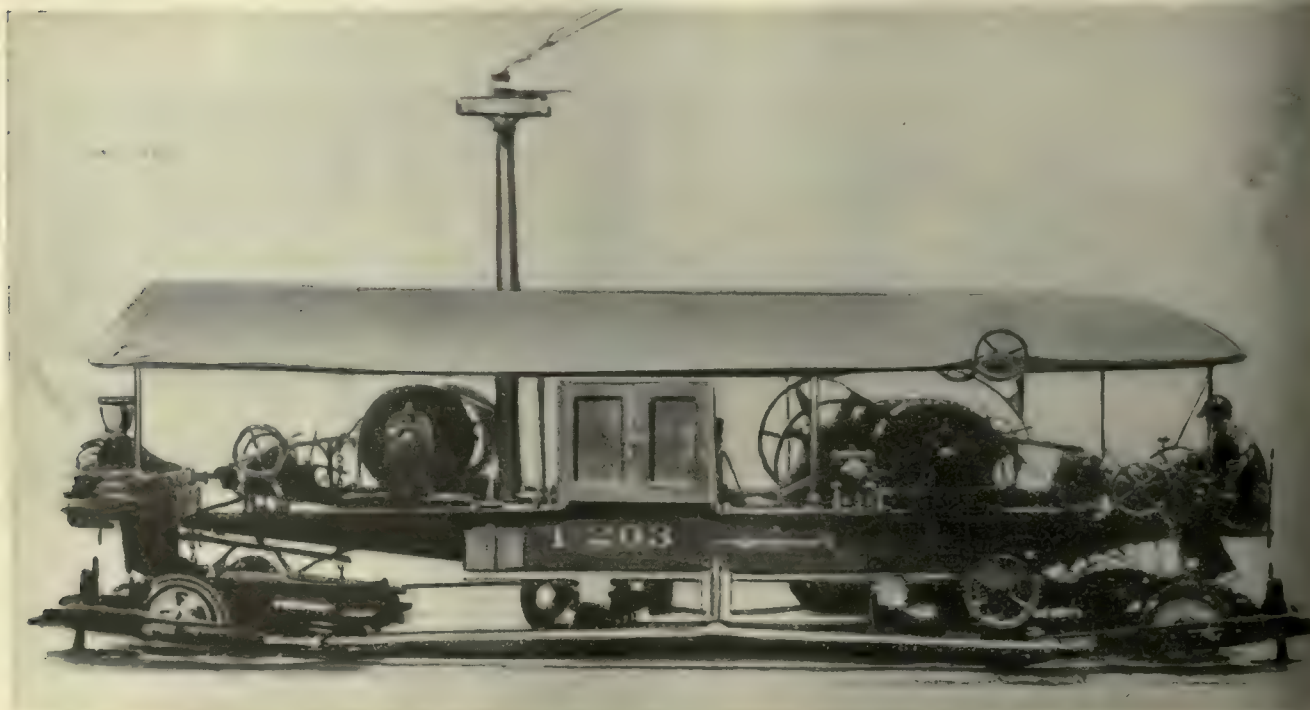
them special instruction. As an incentive toward power conservation, contests are conducted among the twelve divisions, the one making the best record receiving a flag trophy.

In order to maintain the 3,500 meters in use by 7,000 motormen there has been developed and turned out from the company's shops a meter test car—which is an electrical testing laboratory on wheels. This unit is equipped with standard trucks, four motors, control apparatus and air brakes. One-half of the car contains power generating and distributing apparatus, small tools, storage batteries, etc. The other end contains facilities for cleaning, repairing and calibrating

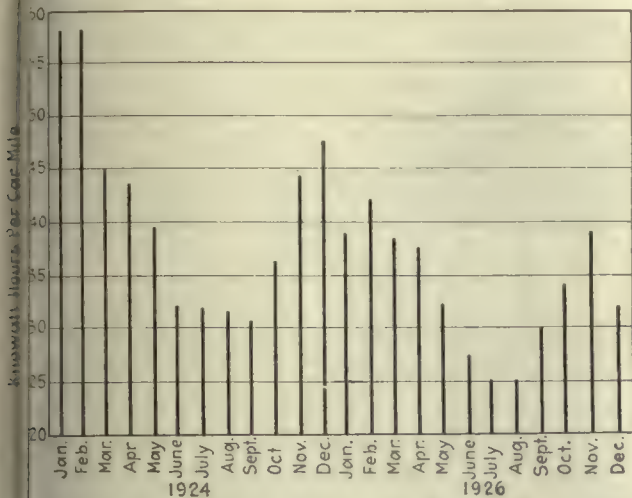
To prevent mercurial poisoning special equipment was designed by the company's engineers to take care of cleaning the meter mercury. For the past three years the maintenance cost per meter per year (exclusive of overhead) was: 1924, \$1.81; 1925, \$1.64, and 1926,



An Ingersoll-Rand Model 20 air compressor of 20 cu.ft. displacement, mounted on a Ford chassis, provides a flexible and efficient compressed-air unit for trackwork



Rail corrugations in Chicago are removed with a Kerwin double ended grinder that speeds the work and reduces cost in comparison with a single machine



The Chicago Surface Lines energy economy story at a glance. The saving during the winter months is particularly important, since that is the period of peak demand

\$19. The energy saving resulting from the use of trolleys has permitted car-miles operated since January, 1923, to be increased 8.4 per cent with little attention given to increasing distribution copper.

By the use of outdoor-type automatic reclosing circuit breakers for equalizing positive feeders, there has been a marked increase in trolley voltage that has obviated the necessity for adding positive feeders. This device is used to adjust the load between heavily and lightly loaded districts. A large investment for additional copper also has been avoided because the primary distribution system was originally designed on such a liberal basis as to permit of increasing loads.

From the standpoint of maintaining a constant flow of power in any eventuality, the Chicago Surface Lines employ most of advanced ideas and equipment known to the industry. Through the medium of a well-organized welding force, both on the line and in the shops, poles are kept in constant repair. In the street, where poles have failed at the joint and ground line, it is the practice to weld sleeves around these breaks. Experience in this class of reclamation work shows that the cost of welding is about 30 per cent that of a new pole. In the case of roadways that are being widened, where a 32-ft. pole is needed instead of one 30 ft. in length, the 2-ft. welded extension is made at about 10 per cent of what a new installation would cost. Welding is also being effectively used to reclaim broken poles, truck frames, gear cases,

broken air compressor frames, broken brake-beam and truck castings, and a thousand and one auxiliary parts used on the property.

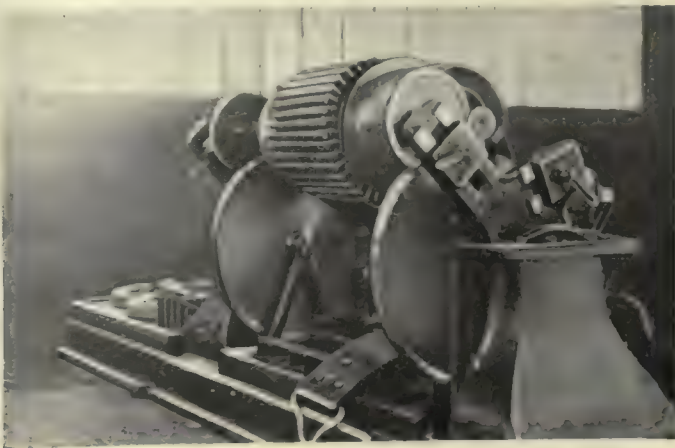
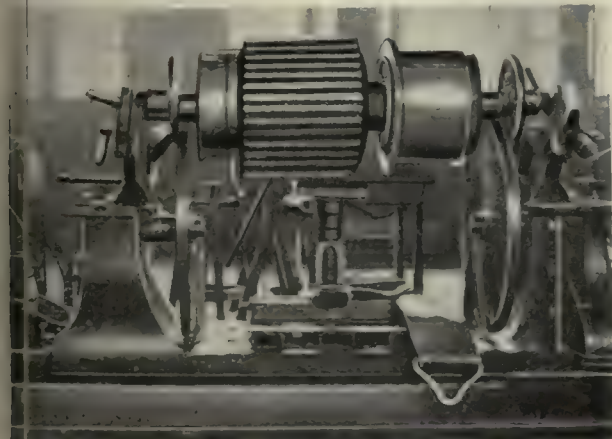
As the line of defense to insure an uninterrupted power supply, there is maintained a motorized department for maintenance and construction. Of the ten tower trucks owned, three are assigned to emergency patrol and are fully equipped to meet any trolley situation. There is one truck for each emergency district. Five of the tower trucks are of 3½ tons capacity, these having been bought in 1926 to replace obsolete equipment. Some idea of the economy effected by motorization is gained by the following comparison of former and present unit equipment. In place of four tower wagons, two reel wagons, fourteen horses, six teamsters and 22 men formerly required, there are now two tower trucks, one express truck with a reel rack, three chauffeurs and nine men. Recently a combination cable puller winch and pump for pulling lead-covered cable was acquired. This is mounted on a truck that is of sufficient dimensions to carry the equipment necessary for complete cable installations, including two large reels.

Balancing Armature Cores in Paris

SO MANY opportunities exist for an armature spider, core and commutator assembly to get out of true it is not surprising that many of them are out of balance when they are received in the electrical shop for rewinding. The effect of any considerable unbalanced weight in a rapidly moving armature necessarily is added wear on the bearings and strain on the housings. Recognizing this, the Metropolitan Railway of Paris, France, tests all armatures on a balancing machine before they are rewound. Two views of this machine, which is known as an "equilibreuse" and is manufactured by Jost & Company of Paris, are shown herewith.

The machine has two large disk wheels, one at each end, on which the armature is placed. These wheels are mounted with ball bearings so that they will allow the armature to turn freely. There is a pair of smaller ball bearing disks at each end, placed so that they will restrain the armature shaft and keep it from riding over the large wheels, thus preventing the armature from rolling off the machine.

The armature is delivered to the balancing machine



Two views of the armature balancing machine used in the shops of the Metropolitan Railway of Paris. The cores are equalized on this machine before being wound

by a traveling crane. It is carried in a leather sling, of a type used to some extent in American shops. In order to prevent the possibility of damage to the delicate portion of the mechanism the armature is lowered onto a screw jack, shown in the center between the main bearings. The weight is then transferred to the balancing wheels without shock. After being set in place the armature is leveled up with a spirit level, then turned slowly two or three revolutions and allowed to come to rest. If it is heavier on one side, it will oscillate back and forth, finally coming to rest with the heavy side downward. It is then possible for a workman to add sufficient weight to the lighter side so that the core is completely balanced, which is indicated by lack of oscillation, the armature slowly coming to rest. The weight is usually placed on the pinion end. Sometimes as much as 10 lb. is required, while for other armatures $\frac{3}{4}$ lb. or less will suffice.

Incidentally, all of the armatures used on the Metropolitan are wound with copper strap instead of wire. Each slot holds five of these straps formed to shape, taped individually, then placed together and taped again. The conductors are placed in the slots in mica troughs covered first with insulating paper, then with two sheets of oiled linen, then with another sheet of insulating paper. The upper coil is held down with a wooden wedge extending the entire length of the slot, being dovetailed into its sides. The wood used for the purpose is horn-beam, which is quite similar to the American water beach, from which the elastic tips for fishing rods are usually made.

Rehabilitated Cars Secure Patrons for Railway

"TUSCARORA" is the name for one of two rehabilitated cars recently put in service between Detroit and Toledo by the Detroit, Monroe & Toledo Short Line Railway, Detroit, Mich. Plans for their rehabilitation included the placing of individual, fully cushioned seats of the bucket type commonly used by de luxe motor coaches. The cars are also equipped with a baggage rack



What the Detroit, Monroe & Toledo Short Line Railway has done in the way of rehabilitating some of its rolling stock. A baggage rack is located at the end of each car, where free checking obtains

on the rear platform for the free checking of passenger hand baggage by the conductor. The seats are individual chair type, leather upholstered.

"We have had," writes Mr. Roger, "a great many favorable comments from our patrons on this type of seat and they are attracting some business to the rail line from the coach line. The equipping of the two cars now in operation was accomplished by removing the old type seats from two of our all steel cars, repainting the exterior and interior and giving each car an individual name. Our intention is to equip other cars in a like manner as conditions will warrant and operate them in limited service on our principal lines, including the line between Detroit and Cleveland."

Commenting further on the construction of the cars Mr. Roger continues: "The idea of the baggage compartment on the rear platform has been received favorably by our patrons. This was installed to avoid the unsightly overhead baggage rack and to avoid the necessity of having to bring baggage into the main section of the car, where it is more or less in the way of the passenger."



The "Tuscarora," an old car in new dress which is attracting patronage for the Toledo Short Line Railway

Home for Way Department Made from Carhouse

Shop, storage and sand-drying plant made from abandoned building in Richmond, Va. All maintenance of way and construction forces concentrated at this point



Plenty of room is provided for the storage of maintenance of way materials in this converted carhouse

SEEKING a suitable headquarters for the maintenance of way forces, a substantial brick and concrete building approximately 280 ft. x 75 ft. has been remodeled at small expense by the Virginia Electric & Power Company, Richmond, Va. A 12-in. brick wall extending across the entire width of the building divides it into sections 212 ft. long and 67 ft. long respectively. The 67-ft. section contains three rooms separated by brick walls, as shown in one of the drawings. The machine shop, blacksmith shop and dry sand loading room is approximately 59 ft. x 67 ft., the sand room 35 ft. x 15 ft. and the storage room 3 ft. x 15 ft. Wide doors permit easy entrance of motor trucks and cars. The larger section of the building is used entirely for storage of maintenance of way material.

The building was constructed for a carhouse by

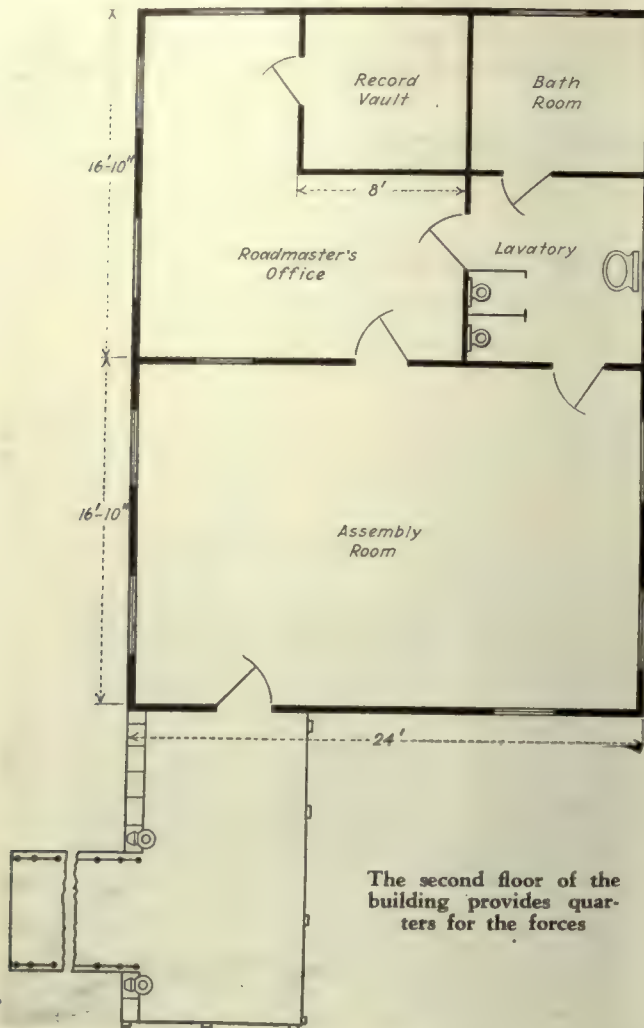
one of the predecessor companies, but after the consolidation it was abandoned. It is, however, in an excellent location on a main line and within 500 ft. of the Southern Railway. The ground adjacent to the building is cut by a ravine some 20 ft. deep for practically its entire length. This provides a good place for disposal of excavated material and other waste. In the course of time the filled property will become valuable.

Three tracks run into the building and one along the ravine, all being connected to the main line. The center track runs entirely through the building, connecting with the ravine track front and rear, while the others end at the dividing wall inside the building.

Special work and rails are stored along one wall inside the building, while on the opposite side are miscellaneous supplies. Between the ravine track



The roadmaster's office is accessible from the main line track above the sand-drying installation



from flat cars. This bin is 18 ft. x 26 ft. with 12-in. reinforced concrete walls. The floor is inclined, with a maximum depth of 18 ft. A chute from the lower end of the bin permits delivery of wet sand by gravity to the sand-drying room. One-third of the bin has a hinged cover, while the balance is covered with reinforced concrete.

The drying room is equipped with a sand-drying stove and a reinforced-concrete dry sand bin, built in two sections, one for reserve with a capacity of 25 cu.yd. and the supply section 12½ cu.yd. The inside dimensions are 9 ft. x 15 ft. The reserve bin is 5 ft. deep, while the supply bin has an inclined floor, with a depth of 5 ft. at the lower end. A chute from the supply bin passes through the brick wall, entering a pit in the machine shop, which is 15x60 ft. A 6-ft. ramp 30 ft. long is built in this pit directly in line with the driveway, so that motor trucks can be loaded with dry sand by gravity. The only manual labor required is that of shoveling the wet sand into the stove and the dry sand into the storage bin. Members of the regular organization do the work, since emergency men are on duty day and night. An average of 8 cu.yd. of sand is used daily.

It is planned to install suitable equipment in the machine and blacksmith shops for the way department's maintenance work. The expectation is that this arrangement will prove economical and decrease delays while waiting for other departments to do work.

A floor over the sand-drying section of the building is used for the roadmaster's office, record vault, bath-room, lavatory and assembly room. This has an area of 25 ft. x 34 ft. During inclement weather the assembly room is used for foremen's conferences for discussion of maintenance of way problems and the advancement of a program for closer relations.

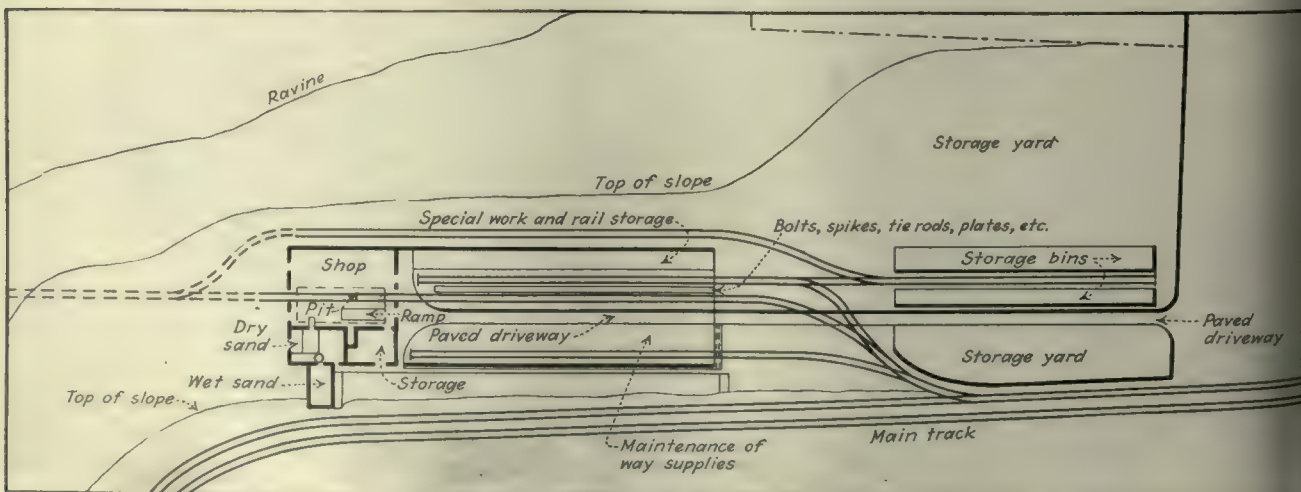
and center track are bolts, spikes, tie rods, plates, etc. To facilitate the handling of the material by a motor truck a 6½-ft. paved driveway runs from the main road to the dividing wall within the building.

SAND-DRYING EQUIPMENT

A feature of the installation is a complete sand-drying plant. A wet sand storage bin of 156 cu.yd. capacity has been installed adjacent to the main line track, which is high enough that sand can be dumped into it direct

Boston Elevated Announces Educational Program

ANNOUNCEMENT has been made of the Boston Elevated Railway's educational program for 1927-1928 in a pamphlet recently issued to the company's employees. The program for the year is simple but varied, including some popular courses offered in previous years and two or three new ones. The schedule which has been arranged so that employees can get



Layout of the maintenance of way building of the Virginia Electric & Power Company at Richmond

variety of opportunities, includes the following subjects: Supervised reading, history-making events of the day, public speaking, correct English, investing savings, increasing personal powers, every-day law, fabric painting, maintenance of automotive equipment, and psychology of personality. In addition there will be foremen conferences and group conferences in various departments. In the announcement, Edward Dana, general manager, stated in part: "On Nov. 1 we open the fifth season of the Boston Elevated educational program. The enthusiasm which marked the closing exercises last May showed that the courses had met a real demand on the part of a large number of employees. The aim of the educational program is to meet the needs of Boston Elevated men and women who realize that their personal satisfaction and their progress in the industrial world depend upon their mental capacity and alertness."

New Bus Repair Shop in Los Angeles

Particular attention has been given to provide a well-lighted and ventilated building. Fourteen pits provide repair space for 30 buses at one time. Two 5-ton electric cranes handle material

RECENTLY a new bus inspection and repair shop was completed by the Los Angeles Railway, Los Angeles, Cal. The building is 100 ft. wide and 310 ft. long. It is of brick, steel and concrete and is equipped with a wet pipe automatic sprinkler system.

To provide the most modern mechanical equipment for the inspection and repair of the fast-growing fleet, engineers of the Los Angeles Railway made a compre-

hensive study of desirable features. Particular attention was given to the lighting and ventilating of the building, with a view to facilitating the work and improving conditions for the mechanic. There are three bays to the building and the three roofs are arranged in sawtooth fashion, each section being equipped with skylights running its entire length.

Windows along the north side of the building run the entire length, each window being 12 ft. wide and 24 ft. high. They are arranged so that each workman's bench has an individual window. Buses enter the building through the south side, the floor of the garage being on the same level as the yard. Fifteen pits running crosswise of the building accommodate 30 buses at one time for inspection and repair. Each pit is 3 ft. wide and 4 ft. 6 in. deep and is equipped with recesses for tool boxes and electric lights for the mechanics.

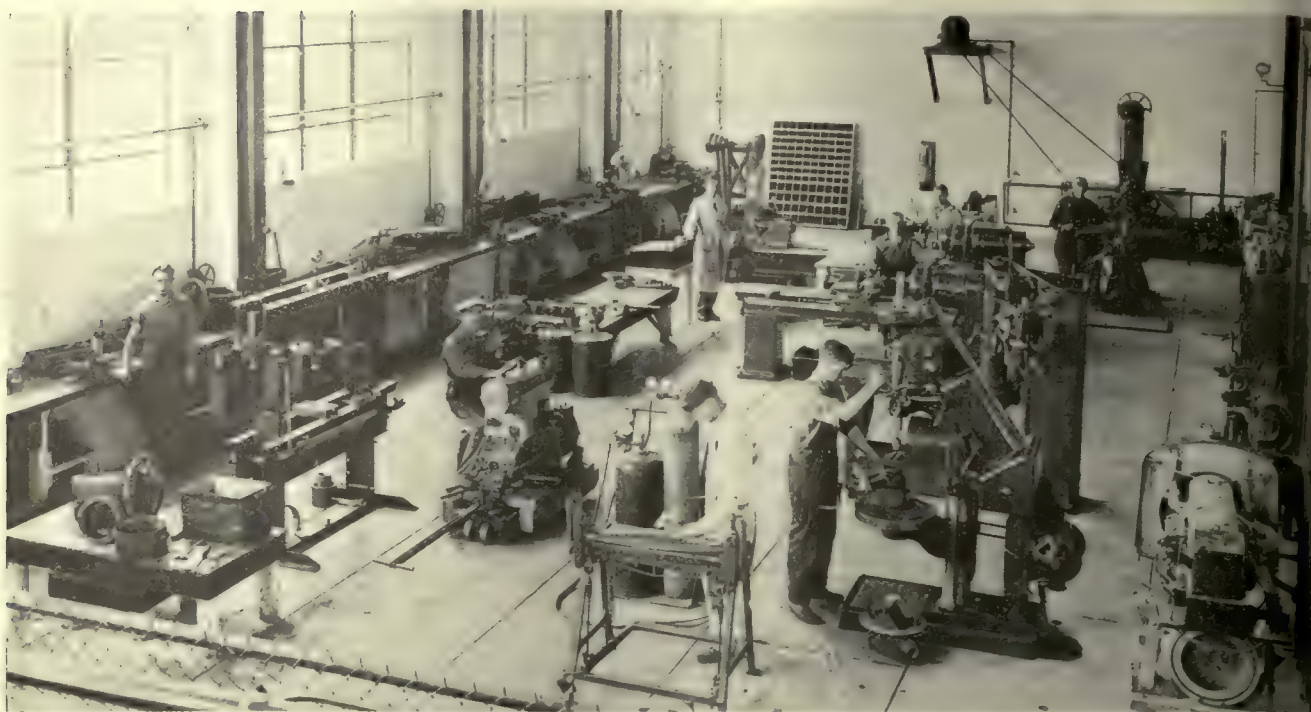
In addition to these, a main pit runs lengthwise of the building on the north side and the fifteen cross pits open into this main pit. In the main pit there are workbenches on both sides and on the south side tool cupboards or lockers are provided, so that each individual mechanic has one assigned to him. Between these tool lockers are steps to the floor level. The mechanics on the floor level also have their individual benches and there is no necessity for a mechanic in the pit to come to the floor level for his tools, or the mechanic on the floor level to go to the pit. All workbenches are covered with sheet iron to give increased service.

Two 5-ton electric cranes with three-motion operation do all the lifting and handling of material. They are controlled by pull handles which can be operated by the mechanics from the floor or pit level.

An accompanying illustration shows the machine shop and the tool room, which is situated at one end of the building. This is equipped with lathes, drills, etc., to take care of the numerous repair operations necessary.



General view of interior of repair section. A long pit at the ends of cross pits is used for bench work



The machine shop and toolroom occupies the east end of the building. It is well equipped with the latest tools

Showers, washrooms, toilets and lockers for the mechanics are located in the basement, directly underneath the toolroom. The foreman's office, battery room and a portion of the storeroom adjoin the toolroom on the ground floor. A mezzanine floor immediately above these departments contains offices of the superintendent of automotive equipment and also the general office of the garage, together with a storeroom. This storeroom is equipped with a hydro-electric elevator for handling material between the two levels.

Car Breaks Through Undermined Omaha Track

ON THE evening of Sept. 8 a double-truck street car of the Omaha & Council Bluffs Street Railway, weighing about 23 tons and loaded with passengers, broke through an undermined section of track at 38th and Cuming Streets, Omaha, Neb. Luckily, no one was injured and the car merely received injured brakes due to the twisting of the car. The veteran motorman, who felt the car sinking and heard the noise incidental to the breaking of the pavement, applied all the power and rode the loaded car to solid street without derailment.



Section of Omaha track undermined by water from broken main

The undermining, which was caused by the breaking of a 24-in. water main, developed under a 220-ft. section and made a cavity from 7 to 10 ft. deep and from 10 to 15 ft. wide. Due to recent repaving, the escaping water could not break through the street. Following the tracks for 220 ft. it finally broke through a street fill and flowed to a low tract at the side.

It is interesting to note the track construction which supported the considerable weight before sinking. The track is constructed of Lorain rail, section 97-424, laid on 6-in. x 8-in. x 7-ft. sawn, creosoted, red oak ties, under which is 6 in. of crushed stone ballast, rolled and pneumatically tamped. Between the ties and 2 in. above is a concrete base of 1:3:5 mixture and the surface pavement is brick block grouted.

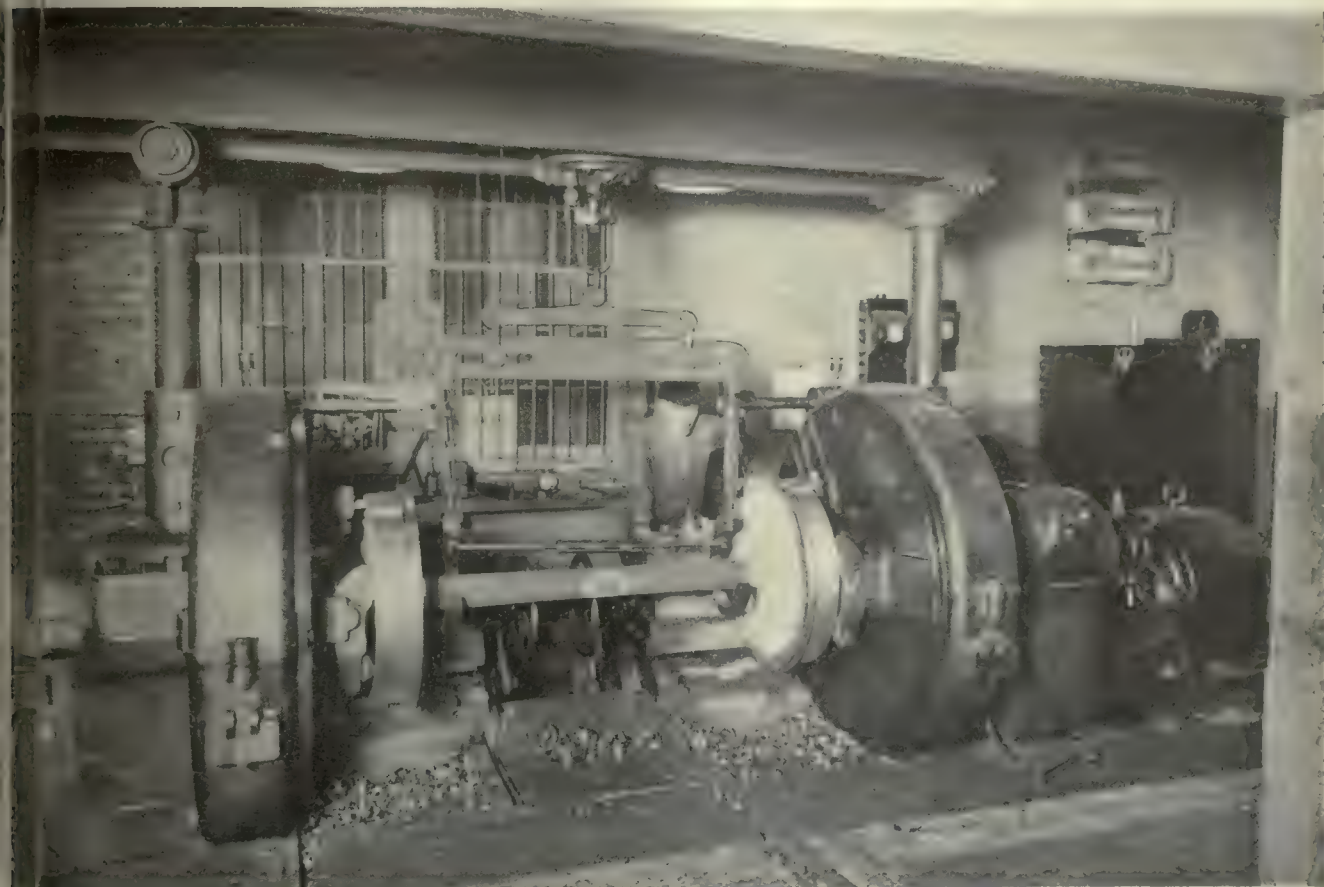
About 1,000 cu.yd. of dirt was hauled in to fill up the street. Operation of cars was taken care of through use of the other track and temporary cross-overs.

California Lumber Company Electrifies Logging Railroad

ELECTRIFICATION of the logging railroad lines of the Red River Lumber Company, whose main plant is at Westwood, Cal., is, in the opinion of officials of the company, a pronounced success. More than 25,000 cars of logs are transported per season to the mill at Westwood over 17 miles of standard gage road from Chester. In addition to the main line there are also four passing tracks totaling approximately 6,000 ft. in length. The electrification program includes the passing tracks in addition to the main line. Power is derived from the company's steam and hydro-electric plant, supplemented by the three-phase, 60-cycle, 33,000-volt power line from Hat Creek which passes the railroad at Almanor Junction. Electric locomotives are of the steeple cab type of 60 tons each on four driving axles. Each locomotive is equipped with four railway motors, rated at 200 hp. each, with forced ventilation.

Improved Wheel Equipment for Chicago

Turning of about 3,600 pairs of wheels annually is handled by new lathe—Efficient equipment for wheel handling and transporting between shops, together with effective wheel storage, speeds up work



This wheel lathe replaces three old ones

EFFICIENCY and speed dictated the purchase of a new high-capacity motor-driven wheel lathe for turning worn car wheels to correct contour which was recently placed in service by the Chicago Rapid Transit Company. The new machine is a Sellers lathe, weighing about 39 tons. It is set on heavy reinforced concrete foundations and inclosed in a special building at the Wilson Avenue shops.

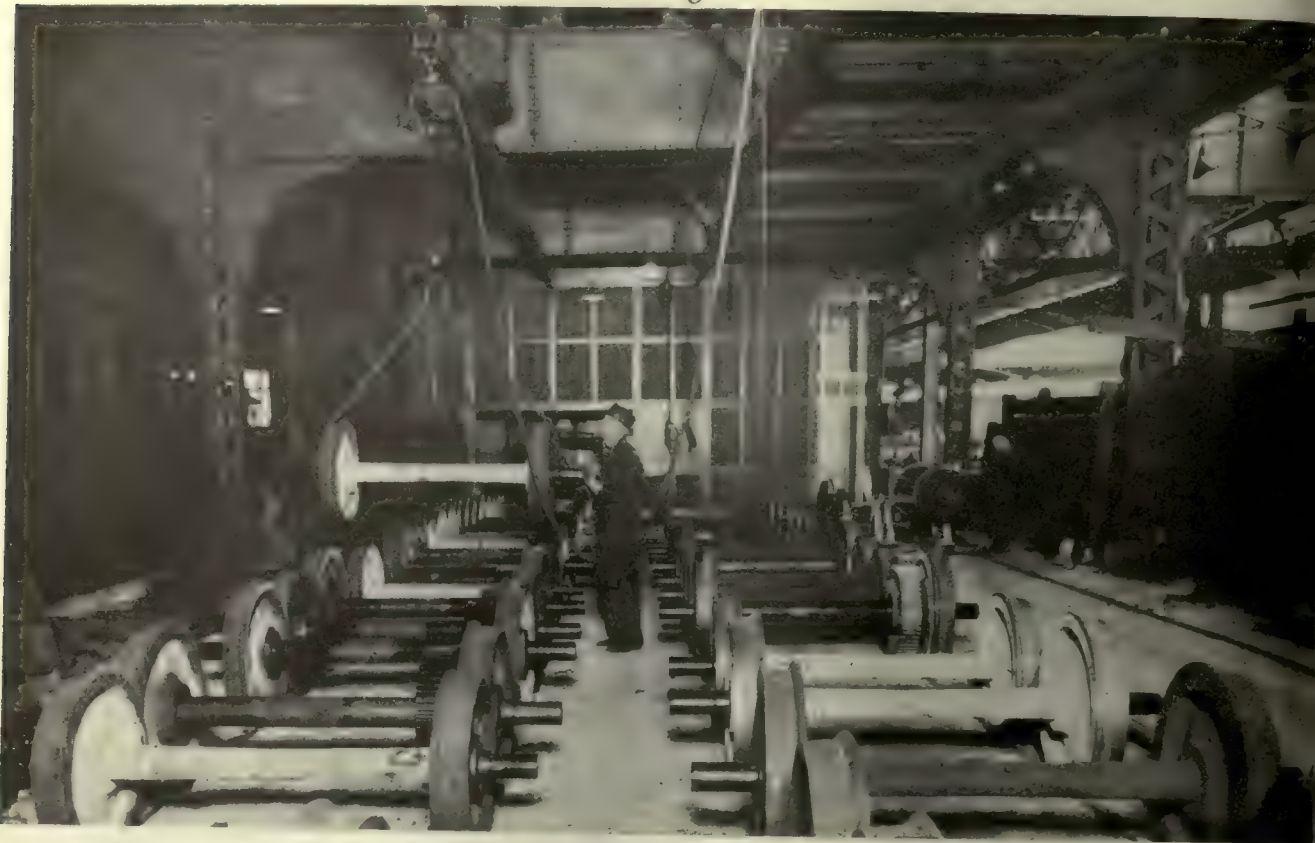
The total installation cost approximately \$35,000. It also included motor-driven tool-grinding mechanism, extra wheel storage tracks, turntables, a 4,000-lb. capacity overhead monorail system for handling wheels above storage tracks and extra tools.

This new machine now handles the entire wheel-turning requirements of the company—about 3,600 pairs of wheels annually. It replaces three old wheel lathes which have been in service from 20 to 30 years. One operator, with a helper, is able to turn more wheels on the new

machine than were four operators with helpers on the old machines.

Maximum operation, however, could be obtained only by the development of efficient wheel storage and handling facilities. Therefore, three wheel-storage tracks 150 ft. long were laid out directly in front of the lathe. Each wheel storage track is served by an overhead monorail system. The three tracks terminate in a feeder track, connecting all four by means of turntables. From the feeder track the wheels run directly into the lathe. This makes it possible to pick up any wheel from any of the three tracks and by means of the monorail system deposit it on the feeder track and thence roll it directly into the lathe.

The same simplicity and rapidity of operation characterize the turning of the wheels. The lathe itself is driven by a 50-hp., 600-volt Westinghouse motor. The tailstock is moved by an auxiliary 8-hp. motor.



These wheel-storage tracks, each 150 ft. long, serve the new lathe

Operation throughout is largely automatic. The 50-hp. driving motor is controlled with three push buttons which actuate switches in automatically correct sequence on a control switchboard. One push button starts the motor and brings it up to maximum speed. Another stops it by disconnecting the current and applying at the same time a powerful electric brake. If an especially hard spot on the wheels is encountered, a third push button at the operator's touch automatically slows down the machine.

Wheels are rolled into the machine and then centered by means of an air hoist attachment. The tailstock of

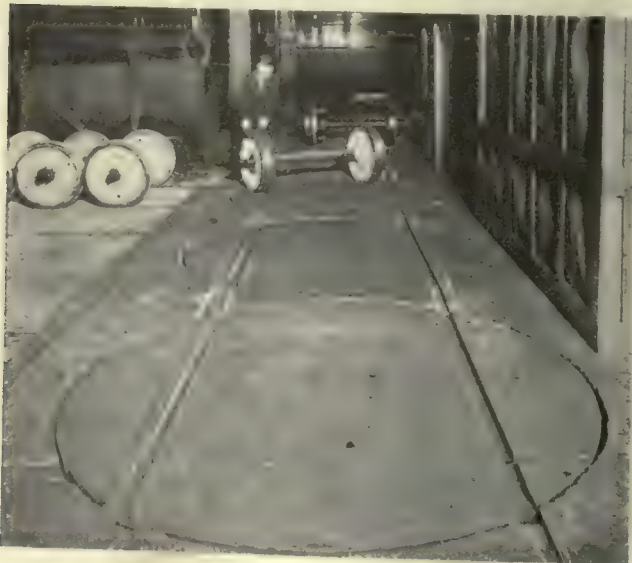
the lathe is then moved forward by means of an 8-hp auxiliary motor to clamp the wheels in position and at the same time to adjust the driving dogs against the work and lock them in place. This auxiliary motor is controlled by a reversing controller which automatically locks the tailstock by an electric brake when the controller is turned back to the "off" position.

The tools are eight in number, of high-grade cutting metal, and four are mounted ready for work in a turret in front of each wheel. When the roughing tool has finished its work the operator releases the tool and turns the turret so that the next finishing tool is in position for instantly commencing its work.

Realization of the expected economy through installation of the new machine has come in reduction of wheel turning costs by two-thirds.

WHEELS HANDLED QUICKLY IN CHICAGO MATERIALS CAR

The worn car wheels are transported to the shops for turning and the finished ones are distributed by means of a special materials car designed and built by the Chicago Rapid Transit Company for the purpose. In this car, which was built by the shop forces, wheels and other railway materials are handled quickly and moved from one division to another. The car has a capacity of twelve pairs of standard motor wheels mounted on axles. Special provision has been made for handling heavy equipment to be transported. A 4,000-lb air hoist runs through the center of the car and the I-beam which supports it has a projection outside for loading and unloading materials. The hoist obtains its air supply from the car compressor and through its use it is possible to move a full load of mounted wheels in



A feeder track with turntables connects the wheel storage tracks



Lifting a pair of wheels by means of the air hoist



Interior of car showing air tanks on either side near the roof and supports for the I-beams of the air hoist

and out of the car in fifteen minutes. This equipment also increases the safety of handling heavy parts.

Two channel frames at the roof on either end of the car, equipped with brackets and rollers, support the I-beam trolley rail for the air hoist. This rail is equipped with a ratchet, and by means of a lever it can be extended so as to project from either end of the car the distance necessary to pick up equipment for loading or unloading. When in position it is locked securely.

The subframe and superstructure of the car are constructed of steel and are designed so as to carry the capacity load of the air hoist to any point necessary for loading or unloading. The mounted wheels are placed in a diagonal position on the floor of the car. Substantial wooden blocks prevent any rolling which might injure the finished surface of the axles and also provide extra protection toward keeping the wheels stable while being transferred.

Steel Tower Supplants Seven Wooden Poles

POWER for operating the entire street railway system of Fort Worth, Tex., is supplied by one substation at East Front and Calhoun Streets. This station is so located that all of the feeder wires have to leave and enter it from one direction. For a long time these wires were carried on one line of poles, which had to be heavily guyed because of the tension on the feeders. One pole was directly in front of the main door of a large drug concern. All this brought about a crowded condition of both street and pavement.

A short time ago it became necessary to renew a number of these poles or to replace them with some other kind of structure. The latter plan was adopted, and the steel tower illustrated on this page was purchased from the Muskogee Iron Works, Inc. It is 40 ft. high, 5 ft. of which is imbedded in concrete. Two 2-ft. x 2-ft. towers, connected by 10-ft. bars, give a length of 14 ft. to the span. The total estimated load is 36,000 lb. The factor of safety is approximately two. Elimination of seven poles was made possible by the erection of the tower.

While the first cost of the tower was considerable, the company considers it has many advantages. One is reduced maintenance. Another is that at the corner where the tower was erected the street traffic is heavy, and with poles the feeder line had no real protection from interruption due to collisions by automobiles. The result of a bad blow from an automobile might have been a tie-up in the power supply. This, in turn, would have paralyzed the street railway transportation of the entire city. In addition to these engineering advantages, the Northern Texas Traction Company points out in its 1927 Coffin brief, from which this view and information were taken, that the appearance of the street has been improved. Many favorable comments have been received since the work was completed and the merchants near by are pleased.



This tower replaced seven wooden poles in Fort Worth, Tex. It makes the power supply more reliable and improves the appearance of the street

Restoring Worn Fits in Motor Frames

RECONDITIONING of 164 split-frame railway motors for active service is a problem recently solved by the Northern Ohio Power & Light Company, Akron, Ohio. The work included the reboring of the frames for oversized oil-sealed housings, the building up by welding and then reboring of bearing axle seats for standard Westinghouse axle bearings and the installation of new helical gears and pinions.

When the railway laid out a program for the rebuilding of 41 of its large city cars in order to make them suitable for one-man operation it was found advisable to overhaul the motor equipment.

At the start four cars were taken into the railway shops, the motor equipment was removed, the fields, armatures and brush riggings taken off and reconditioned and other overhauling done. Later the schedule was increased to six cars per week, which were taken out of service at one time. In the work of building up and remachining worn fits the axle bearing seats were built up by welding, this work being done by the railway company. After this was completed, the frames, sixteen at a time, were loaded on a work car and taken to the Westinghouse company's shop in Cleveland, where additional work was done. This work included careful checking of the frame, remachining of the housing fits and the complete equipping of the motors with new housing and heat-treated bolts. With the program properly organized sixteen frames were turned out every week. This met the schedule of the railway.

The work of machining the motor frames was done on a single spindle horizontal boring mill. The two motor halves were bolted together over a cast-iron drum, this being machined so as to fit exactly the pole piece seats. The drum was bored out in the center so as to make a perfect fit on the boring bar.

In the assembly for machining the entire motor frame was mounted on a movable plate, which after the arma-



Set-up used for reboring the axle bearing fits of the motor



A cast-iron drum accurately machined to fit the pole piece seats was placed inside the motor frame

ture bore had been made could be slid over 14 in. against a permanent stop. This brought the job in line for the second operation, of boring axle bearing fits.

As a result of this rehabilitation work the motors are running quietly and with an efficiency equal to that of new motors.



In transporting the motor to Cleveland small trucks and a supply car were used

De Luxe Cars Feature of New Service on Chicago & Joliet

ENHANCED by rebuilt units, a fast through electric service between Illinois cities and Chicago, with no change of cars, is now being offered by the Illinois Traction System in conjunction with the Chicago & Joliet Electric Railway. Four through trains daily in each direction connecting LaSalle, Utica, Starved Rock, Ottawa, Morris, Joliet and Chicago provide convenient

Illinois Valley Limited." Work of rebuilding nine standard one-man cars to fill this service was done in the Illinois Traction shops at Ottawa.

Schedules for the through Chicago and Illinois Valley trains have been arranged to fit the convenience of the travelers between Chicago and the valley cities. From LaSalle to Joliet the tracks of the Illinois Traction Sys-

Nine of these comfortable rebuilt units are now being operated by the Chicago & Joliet Electric in conjunction with the Illinois Traction System as the feature of a fast through electric service between Chicago and Illinois Valley cities. Tangerine, cream and mahogany is the color scheme



service for the through traveler between the Illinois Valley and Chicago.

The new rolling stock for this service is the last word in comfort from the standpoint of the traveler. Individual cross seats, designed by Karpen, supplant the old type double railway coach seats. They are of green wicker, set low at the exact angle for comfort, which is increased by high spring backs and air cushions. Natural leather was used for the upholstery. Car floors are covered with heavy taupe linoleum. The front observation feature of Illinois Traction System equipment, popular with the road's patrons, has been retained.

Exterior treatment of the through cars includes the familiar tangerine shade on the lower part of the car, while the upper work is finished with a cream shade, with a deep mahogany trimming. The cars carry the oval traction service symbol and there is painted on the window panel and boards the designation "Chicago and

Illinois Valley Limited." Work of rebuilding nine standard one-man cars to fill this service was done in the Illinois Traction shops at Ottawa. Schedules for the through Chicago and Illinois Valley trains have been arranged to fit the convenience of the travelers between Chicago and the valley cities. From LaSalle to Joliet the tracks of the Illinois Traction System are used and from Joliet to Chicago the cars operate over the line of the Chicago & Joliet Electric Railway. There is no change of cars at Joliet. Chicago bound trains switch from the Illinois Traction tracks on Van Buren Street in Joliet to the Chicago & Joliet Electric Railway tracks by means of the new double end connection which was jointly installed by the two companies. Limited cars from Chicago to Illinois Valley points are switched to Illinois Traction tracks on the return trip. Each company uses its own operators and methods of fare collection while the cars are on its rails. The Chicago & Joliet Electric Railway at Archer Avenue is convenient to surface line street railway service to the Chicago Loop district and other points.

Fares between Illinois Valley points and Chicago by this service are substantially lower than by other carriers. Because of the lower fares and added convenience the service is very attractive.

Erie Railway

Improves East Lake Road

CONSTRUCTION work has been completed on the widening of East Lake Road, Erie, Pa., and the removal of the Erie Railway's tracks from the private right-of-way and their relocation in the center of the highway. The railway extends easterly from the old east limits of the city past the General Electric plant and terminates at Four Mile Creek, a distance of approximately 2 miles. Plans for the improvement specified that the width of the road was to be increased from 50 ft. to 120 ft. between property lines and that two 20-ft. asphalt drives were to be installed, with the two car tracks between on a 22-ft. non-paved strip. An overhead distribution system center-pole type was called for, with all other poles removed except one line on either side of the road for

East Lake road improvement under construction. One track located in its permanent position. Excavation work performed by modern apparatus



the lighting, telephone and telegraph companies. It was estimated that a required expenditure of at least \$65,000 was necessary for this work.

This plan necessitated removal of the rails, feeders and trolley from the private right-of-way and reinstallation in the new location without interfering with a



Erie Railway's tracks relocated on East Lake road without any service interruption. Temporary track being shifted to permanent location



The new location of the tracks is on the private right-of-way in the center of the 120-ft. roadway. The old track at the left has been removed

ten-minute headway of the city cars and a one-hour headway of the interurban cars.

One hundred tons of new 70-lb. T-rail was purchased and laid in the proper center location on 7-ft. creosoted ties spaced on 30-in. centers. The foundation was 8 in. of cinders, carefully hand tamped until they were flush with the tops of the ties. This initial installation permitted removal of the old rail from the private right-of-way.

When this center section of track was completed, the service was diverted to it through suitable temporary switches. The track material removed from the abandoned section and found suitable for further use was reinstalled in the new center location in the same manner, and connected with the first completed section. This method of abandoning sections and building sec-

tions was repeated until all cars were running on the new center construction.

Each rail joint was bonded with one O-B type AW-8 welded bond, and the rails were held together with six-bolt fishplates. Bracket trolley suspension was adopted as most serviceable. The brackets were attached to Bates expanded steel poles 25 ft. long, placed 6 ft. 6 in. from the track centers. Each pole was installed in a concrete foundation of 18 in. diameter, 6 ft. deep. Poles were spaced approximately on 100-ft. centers. One crossarm at the top of each pole supports two telephone wires. A 500,000-circ.mil feeder extending the entire length of the improved section was fastened to each pole by means of a bracket.

In 1901 the owners of the transportation properties of the city of Erie constructed a two-track railroad from



Appearance of the tracks and overhead construction on the 22-ft. island located in the center of the East Lake Road improvement

the eastern end of the city to the Four Mile Creek amusement park. These tracks were laid on either side of the 50-ft. highway on a 10-ft. strip of private right-of-way.

In 1911 the tracks were extended to the Six Mile Creek and the interurban cars of the Buffalo & Lake Erie Traction Company were diverted over the line into the city of Erie. Shortly afterward the General Electric Company began the erection of a plant on a site adjoining the East Lake Road and near Four Mile Creek. When this plant was put in operation the handling of the employees over the Lake Road by rail and roadway became quite important. Additional transportation facilities had to be provided. Due to the narrowness of the roadway, it was soon found that considerable vehicular traffic congestion occurred, especially during those periods of the day when the General Electric employees were en route to and from their work. This congestion soon became so serious that it was determined that relief could be obtained only by widening the street.

After considerable discussion between the city of Erie, the General Electric Company, the Hammermill Paper Company and the Erie Railway, a decision was reached in the spring of 1926 for the apportionment of the expense of widening of the road together with other work necessary to make the road an up-to-date transportation highway.

It was not only necessary to remove the tracks from the private right-of-way and reinstall them in the 22-ft. island located in the center of the road, but hills had to be cut away, hollows had to be filled and sanitary and storm sewers had to be installed. It was necessary to perform this work without any interruption to the street car service or vehicular traffic.

Since modern excavating and track building machinery was used throughout the entire work, it was possible to carry on the reconstruction in an efficient manner.

With the improvement completed, the Erie Railway now has a modern, up-to-date double-track installation capable of efficiently handling the additional heavy traffic. The city of Erie is provided with a broad, properly drained highway connecting with the main Buffalo and Cleveland highway via Iroquois Avenue and Harbor Creek, making an excellent entrance to the center of the city.

The Readers' Forum

Why Continue to "Soak" the Street Car for Paving?

UTAH LIGHT & TRACTION COMPANY

SALT LAKE CITY, UTAH, Aug. 24, 1927.

To the Editor:

Evolution has been taking place consistently in all branches of the street railway industry with one exception. This is the city's attitude toward paving about street car tracks, which in the majority of cities has not changed one iota from the day of the mule car. Operating conditions have changed considerably from the period in the past when companies were required to obliterate the tracks of their mules by filling in, surfacing and grading their rights-of-way on public streets. Other forms of speedy transportation have developed, with the result that today we find innumerable agencies by which people move from place to place.

Street railways whose tracks are in paved streets pay from one-third to one-half of the paving costs on such streets, yet on the basis of use made of street space and service rendered the greatest number of people per carrier a gross inequality exists because the use street cars make of streets is not equivalent to one-half of the total use made of such paved thoroughfares by all vehicles.

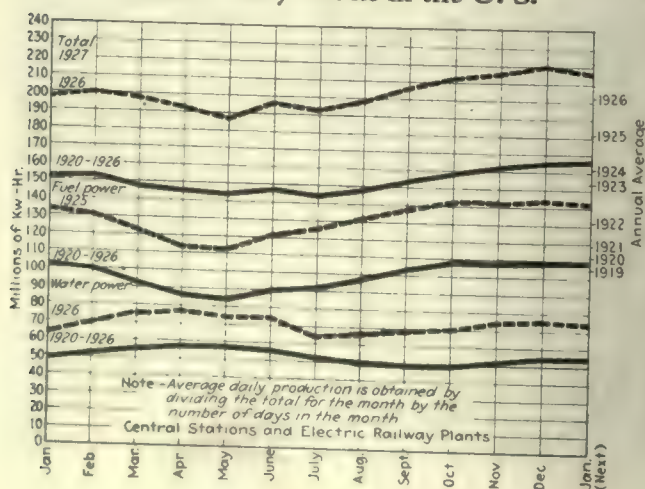
As to the question of street railways maintaining the pavement about their tracks and keeping the street in first-class appearance, let it be said that it is no easy matter to secure funds sufficient to maintain paving about them after expending large sums to put in the pavement. If street car companies had no paving to buy, but only the pavement about their rails to maintain, that portion of the street for which they are accountable would be the best preserved and appearing on the street.

It will readily be admitted that no business likes to spend money for something that will directly benefit its competitor, yet that is what happens when the street car company pays a paving assessment. Streets, paved and unpaved, are the thoroughfares provided by a city to handle its various kinds of traffic, and traffic of all types will use the streets. Now, when it is the duty of a municipality through its taxpayers to supply pavement, why should one taxpayer, namely the street car company, be obliged to furnish a half or a third of this street surface when it has to supply its rail on which to run?

The sum and substance of the matter is that street car companies throughout the country are, with the exception of a few that have been relieved of paving, still held in the "mule car" class, though they have no mules, whereas the trend of the times is such that the car company can't attract passengers unless it has up-to-date, speedy, modern, attractive equipment operating over smooth track. This requires money which isn't coming into its coffers, but is being diverted to and enjoyed by its competitors for whom it installs pavement. It seems time that the "powers that be" lent ear to the railway companies' side of the paving question and struck off the fetter that makes it almost impossible for them to exist, not to mention the difficulty they have in keeping in step with developments in the industry that necessitate adoption or dropping out of the ranks. The street car is a worthy utility; it is needed; it accommodates the greatest number of people for the space it occupies. Why not give it a square deal?

F. D. HEIGES.

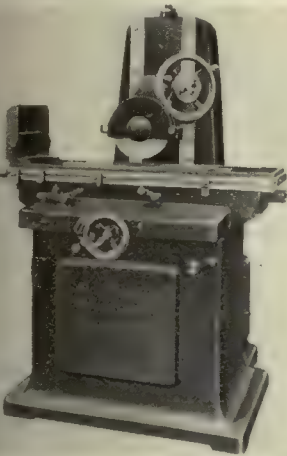
Average Daily Production of Electricity by Public Utility Plants in the U. S.



New Equipment Available

Hydraulic Feed Feature of New Surface Grinder

MORE rapid work with accuracy is provided for by a new type grinder offered to the industry by Gallmeyer & Livingston, Grand Rapids, Mich. An oil gear hydraulic feed reciprocates the table at a variable rate of travel. This provides a range up to 55 ft. per minute by turning the handle at the front of the base. The same oil gear is connected to a cross-feed engine mounted under the saddle. This is arranged so that in each reversal of the reciprocating table the cross-feed mechanism is actuated.



This grinder has self-contained motor drive in the base of the machine

The amount of cross feed for each reciprocation of the table is adjustable.

A one-piece base casting is used. The spindle head carries a very heavy spindle of 2 in. diameter by 8 in. long in the main bearing, with the auxiliary rear bearing 1½ in. diameter by 5 in. long. For rapid raising and lowering of the operating table, a large handwheel gives a direct action to the elevating screw through a worm and gear. The handwheel is graduated in ¼ thousandths with a movable pointer, which can be set for convenient reading. A small knurled knob in the center of the handwheel provides a back-gear action to the elevating mechanism. The disk in the center of the handwheel has a graduated dial ring which can be set at zero in relation to the pointer mounted in the spoke of the large handwheel. Both inner and outer wheels turn, but the graduations on the inner wheel are arranged to read on this moving pointer, giving a vernier

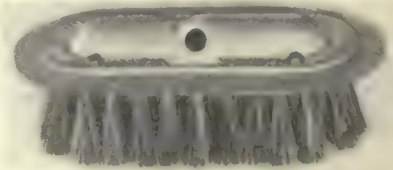
effect. By this means it is easy to get readings of adjustments in tenths of a thousand. This graduation makes for extreme accuracy in grinding the work.

Another feature of the new surface grinder is a variable speed for the work. Various materials call for different speeds and the variable speed feature gives greater efficiency to the grinder.

The illustration shows the machine with self-contained motor drive in the base of the machine. It is equipped for dry grinding only without any auxiliary equipment. A specially designed 10x24-in. working surface magnetic chuck is available. The machine is also offered with wet grinding arrangement, including pumps, tanks, convenient splash guards and piping if desired.

Refillable Window Cleaning Brush

WASHING of windows and other parts not readily accessible from the ground prompted the design of a combined brush and sprayer just placed on the market by the Specialty Manufacturing Company,



This new car washing brush combines the functions of a spray and cleaning brush

Cleveland, Ohio. The type illustrated is in use on several Eastern railways.

The bristles are trimmed to give a level cleaning surface and are set into an aluminum plate or block. The handle is attached to a back plate and be-

Maintenance Contest Stimulates Improved Methods

IN THIS issue is published the sixth group of articles submitted in ELECTRIC RAILWAY JOURNAL'S Maintenance Contest. The half-way mark has thus been reached. This was celebrated in a most pleasing manner at the Cleveland convention when 100 enthusiastic maintenance men sat down to a dinner in honor of those who submitted ideas in the contest. Four capital prizes amounting to \$375 were awarded and the winners were given framed certificates of award testifying to the excellence of the practices that were described.

CONTEST STILL CONTINUES

As announced in the conditions of the contest published in the April 16, 1927, issue of ELECTRIC RAILWAY JOURNAL, pages 700-701, the contest is to run a year, and a prize of \$25 will be given each month. The capital prizes were awarded in the middle of the contest instead of at the end because the convention offered the best opportunity of getting the various contestants together. Those who were present at the meeting were impressed particularly with the value of a broad interchange of ideas among maintenance forces. The greatest good will come from the contest by

increased use on other properties of the practices which have been found of value on the railway from which the idea came. Maintenance men help put railway maintenance on the high plane necessary for popularizing electric railway service by submitting their ideas in the contest. Incidentally they may win one of the monthly prizes.

CONTEST CONDITIONS

1. Any employee of an electric railway or bus subsidiary may compete.
2. The author does not need to be the originator of the idea.
3. Articles may be submitted by several persons or by a department.
4. Any maintenance practice or device for electric railway or bus repairs may be the subject.
5. Articles should be 100 to 200 words long with one illustration, and in no event longer than 400 words with two illustrations.
6. Manuscripts should be mailed to the editor of ELECTRIC RAILWAY JOURNAL, Tenth Avenue at 36th Street, New York, N. Y. To be eligible for the monthly prizes manuscripts will be received until April 30, 1928.
7. Illustration material may be in the form of drawings, sketches, blueprints or photographs. All sheets should be marked "Maintenance Competition."
8. Details of the conditions not given will be found in ELECTRIC RAILWAY JOURNAL for April 16, pages 700-701.

tween this and the front is a hollow space made watertight by means of a rubber gasket. A length of pipe attached to a hose is screwed into a threaded opening in the back plate. Water is forced through a number of fine holes into the front plate.

The edges of the gasket project well beyond the edges of the aluminum water chamber so that the metal itself cannot hit the surface being cleaned and the brush plate may be shifted around on the handle easily so as to wear all bristles equally. When completely worn out the brush may be returned to the factory for refilling at a small cost. The manufacturers claim that this more than compensates for the somewhat higher initial cost as compared with ordinary brushes.

Six-Cylinder Bus Chassis Supplants Four

SIX-CYLINDER engined bus chassis to supplant former four-cylinder models are announced by Graham Brothers, Detroit, Mich. Special features include four-wheel Lockheed hydraulic brakes, four-speed gearset and ball-bearing cam-and-lever steering gear.

Although hoods on the new model are 7 in. longer than on the former units, there is no increase in wheelbase. By maintaining the 162-in. wheelbase better weight distribution on the axles is said to result. The present line includes a 21-passenger street car, 16-passenger de luxe parlor car and de luxe club car seating 12 passengers.

The engine is of the L-head type with a 3½-in. bore and 4½-in. stroke. Camshaft and crankshaft are drop forgings. Pistons are of aluminum alloy with cast-in steel struts. Oil circulation to main bearings is taken care of by a geared pump. The sys-

tem also includes an oil filter and a siphon arrangement to provide against stoppage of oil flow should the strainer become clogged. Electric equipment includes a 225-watt generator with voltage regulator and 215-amp.-hr. storage battery.

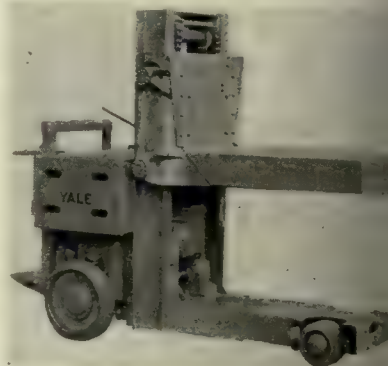
Rear springs are of the three-stage progressive type to afford easy riding under variable passenger loads. Riding comfort is further enhanced by the use of deep-cushioned seats covered with genuine leather. The 12-passenger vehicle has seats of the individual chair type, set at an angle to the body sides. The 16-passenger parlor car provides four double seats along the left side of the body and four single seats to the right of the central aisle. In addition, four individual seats extend across the width of the coach at the rear, one of the latter being removable to provide passage through the emergency rear door. Seat frames are constructed of tubular steel with hardwood bases, the whole being covered with fiber wicker and detachable genuine leather slip cover. Seats in the street car are likewise upholstered in genuine leather with deep spring cushions and spring backs.

High-Lift 3-Ton Truck

FOR the purpose of meeting increased load requirements, a new elevating truck has been added to its line by the Yale & Towne Manufacturing Company, Stamford, Conn. The framework consists of a large gusset plate, ½ in. thick, extending from the forward end to the small trailing wheels. This plate is approximately 24 in. high at the driving wheel axle, and in addition to forming the framework it provides a yoke to serve as a guide for the drive unit and the spring suspension of the truck. The upright channels which

serve as platform roller guides are attached to this gusset plate.

The elevating platform is raised and lowered by means of a 1½-in. diamond roller chain passing over power-driven sprocket at the bottom and an idler sprocket at the top, to reduce friction Hyatt heavy-duty



New type of 3-ton high-lift truck

roller bearings are used in the idler sprocket at the top of the machine. The shifts of the lower sheaves run in a bath of oil, which also serves to lubricate the spur gear reduction units. The two ends of the roller chain are attached to the platform through a spring take-up device which will adjust itself automatically as the chain wears.

The hoisting motor is connected to the spur gear pinion through spring ratchet so arranged that positive drive is obtained when raising the elevating platform. If, however, the platform is checked in its downward travel the ratchet releases.

The elevating platform is supported in the horizontal position by four rollers bearing on the inside of the flanges of the vertical ship channel. Platform members are heavy steel castings with large diameter bosses to support the platform roller pin. By placing the elevating unit between the vertical roller channels all of the available space is utilized. The main drive unit is of the double reduction spur gear type, driving the wheels through totally inclosed universal joints. The entire gear reduction with its differential and bearing runs in a bath of oil.

A four-wheel steering feature allows a turning radius of 96 in. to the outside edge of the truck. By omitting braces it is possible to leave the top of the battery box clear and permit servicing or watering of the battery without sliding it out. The battery itself may be removed by hoisting from the battery box or by removing the side plates of the box and sliding the battery out sideways.



Twenty-one passenger street car body on Graham chassis powered with six-cylinder engine

Hoist with Pressed Steel Frame

QUARTER-TON all-steel electric hoists at a moderate price are announced by the American Engineering Company, Philadelphia, Pa. This hoist is of the high-speed type with pressed steel frame, chrome-manga-



All working parts of this hoist are fully inclosed

ese steel in gears and shafts, ball bearings, non-spinning hoisting rope, oil-bath lubrication, push-button control and upper and lower limit fixtures. All working parts are fully inclosed.

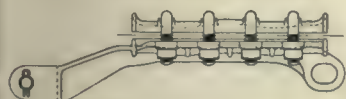
The hoist weighs 200 lb. and is made with either plain trolley or hook suspension. The plain trolley type requires 16-in. and the hook suspension 18-in. headroom.

Dead End Assembly and Strain Clamp

FEEDERS of any size from 500,000 to 1,000,000 circ.mils can be used with the dead end assembly for low-voltage feeder cable recently an-



New dead end assembly



New strain clamp

ounced by the Ohio Brass Company, Mansfield, Ohio. Its design is such that when dead-ending heavy feeders at a corner with this device it is not necessary to strip the insulation back, pass the cable through the insulator and serve individual strands, which

wastes from 6 to 8 ft. of wire, or about 25 lb. of copper.

Interlocked wet ware porcelain gives double insulation. The device has a high strength factor, all metal parts being of galvanized Flecto iron, and is so compact that ladders are not required for its installation in the overhead system.

A strain clamp has also been put on the market by the same manufacturer which permits turning corners on two or more poles without cutting or dead-ending the feeders in both directions. It is designed so that the feeder can carry straight through without any contact with the insulator assembly.

Dick Prescott Has Callers And Gets a Surprise



WHEN Dick Prescott, young assistant superintendent of the Consolidated Railway & Light Company's shop, saw the noon hour approach his uneasiness increased. He could not quite understand the dissatisfaction which had developed in the truck shop and he wondered whether or not the men would send a committee to his office, as he had invited them to do.

In the meantime, we left Shorty Green, the ringleader of the malcontents, approaching big Pete Thompson, who had led the men back to work when Shorty failed to step out of the crowd on Dick Prescott's challenge earlier in the morning.

"Say, Thompson," said Shorty as he approached the big fellow, "I've been doin' some thinkin'."

"What's the matter now?" growled big Pete, obviously not overjoyed at the sight of his visitor. "If some of you guys would do more work and less grouchin' around things in this shop would be better for all of us. I got a wife and kid at home and I ain't interested in your troubles or that bum Welcher either!"

"All right, Thompson, don't get huffy now. I was thinkin' about that committee the boss wanted this mornin'. You'd be a good guy to talk to him."

"Oh, you're tryin' to hand me the bag, are you? Well, there's nothin' doin'. You guys started a fuss just to be doin' somethin' else than workin'. You can't drag me into it no more. First thing you know some

of you birds are goin' to land outside this shop on your ear."

"Wait a minute now and listen," pleaded Shorty Green. "I'm just beginnin' to wake up to what a jack-ass I've been. I ain't got nothin' agin' Prescott at all. Pete Welcher is the guy what's been doin' all the talkin' about Prescott bein' a four-flusher."

"Sour grapes, that's all that is," exclaimed Thompson impatiently.

"I think you're right," was Shorty's surprising answer. "I've just begun to get hep to that myself."

"Why don't you tell that to the boss, then?" demanded Pete.

"I will, Thompson, if you'll go along."

"You're on! No monkey shines, though. You give the boss the whole works and tell him there ain't nothin' wrong in this shop except that bum Welcher."

Shorty and Pete talked a minute or two longer. They decided to get the men together as soon as the noon whistle blew to tell them what they proposed to do.

At a quarter past twelve every man in the shop had voted to demand the resignation of Pete Welcher, the plotting inspector. Green and Thompson were delegated to transmit their wishes to Dick.

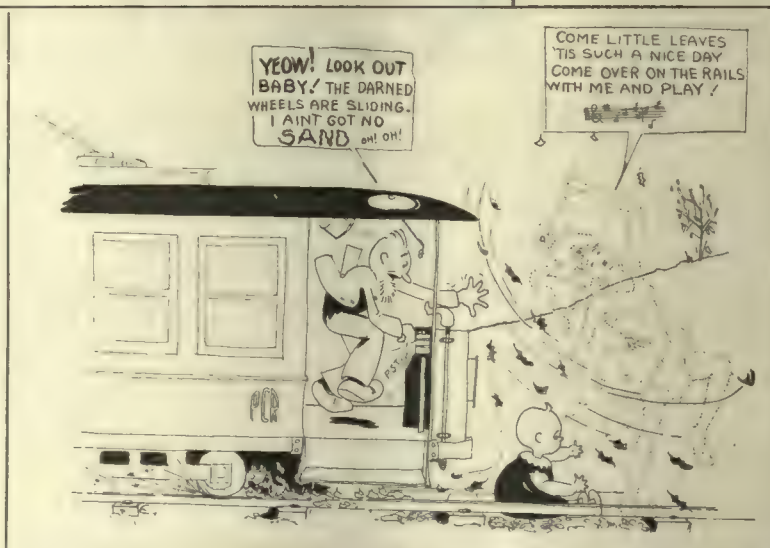
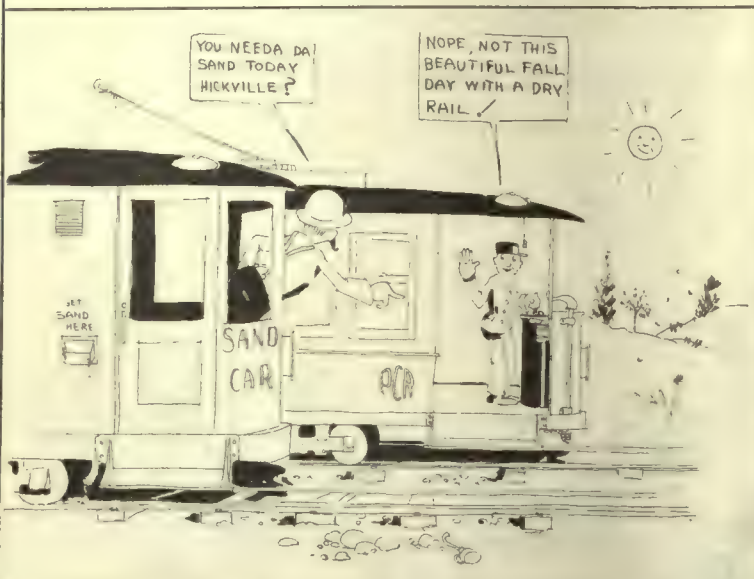
In a few minutes the surprised and relieved young executive was listening with amazement to Shorty Green's story, while big Pete Thompson sat silently by with his cap in his hand.

Adventures of Old Man Trouble

on the
Hicksville Railway

The best safety rule
that was ever written
is

Don't Take a Chance!



How many Hicksville motor-men do you have who never take sand on a nice day? How many fail to report a bad order sander?

How many accidents could have been avoided had sand been available at the proper time?



ELECTRIC RAILWAY JOURNAL will be glad to furnish press proofs of this page for posting on bulletin boards and will supply electrotypes of this series at cost for use in company publications.

Electric Railway Journal Maintenance Data Sheet

ROLLING STOCK—MISCELLANEOUS—12

Machine Assists in Removal and Replacing of Trolley Retriever Springs*

BY A. F. REXROTH

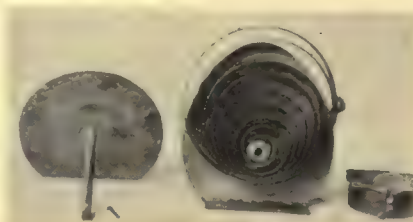
Master Mechanic Harrisburg Railways
Harrisburg, Pa.

WHEN trolley retriever springs break at the eye in the end of the spring, they are reclaimed in the shops of the Harrisburg Railways, Harrisburg, Pa., by drawing the temper at the spot with a welding torch and punching a new eye. The spring is then as good as new.

In order to assist in the removal and replacing of springs a machine has been constructed as illustrated. The spring is placed on this machine and is wound tight and then is held in position by a ratchet on the shaft. The spring can be taken out by

removing the back plate and can then be placed in a retriever or held tightly by a clamp placed over the spring when it is to be stored for future use. The spring is released from the machine by lifting the ratchet and turning the handle to the left.

This machine has been of particular assistance in making repairs as it eliminates the danger from handling these strong springs. It is used in both removal and replacement of the springs and is a great time saver for this work.



Above, machine developed for removing and replacing trolley springs. Below, details of the machine

*Submitted in ELECTRIC RAILWAY JOURNAL Prize Contest.

Electric Railway Journal Maintenance Data Sheet

TRACK AND WAY DEPARTMENT—10

Smooth Pavement with Little Money*

BY H. E. BEAN

Engineer Way and Structures New York State Railways, Syracuse, N. Y.

SMOOTH pavements in car tracks add nothing directly to the revenue of the operating company, but public demand requires a higher degree of maintenance each year and frequently this results in repaving ordinances where many years of life still exist in the track structure. The use of hot tar or asphalt with crushed stone has been found to answer the demand at a comparatively small expense.

The Syracuse lines of the New York State Railways have more than 400,000 square yards of pavement, mostly brick or medium block. Each spring every line is covered by a repair gang of six men with two trucks. One is used for the coarse aggregate and the second for screenings and sand and to tow the tar tank. All depressions, faulty places, cuts or surface removals are patched and the general paving repairs completed

by this means. Miscellaneous failures that develop around special work, etc., are repaired with small quantities of material hauled on a light truck.

In making patches, the hot tar, known as "Binder T" New York State Highway Department, is applied to the cleaned surface with sprinkling pots having slotted openings. Depressions are filled with No. 1 or No. 2 stone, according to depth, and more tar is applied to the stone.

Screenings mixed with sand are thrown over the top to seal the patch and prevent automobile tires from picking up the tar. Patches may be run to feather edges and under traffic soon resemble asphalt. Proper temperature in tank is maintained by a kerosene burner in the firepot.

The local cost of tar at 10 cents per gallon and crushed stone at \$1.50 per ton make a cost, including labor and truck charges, of approximately 50 cents per square yard. The advantages of this construction are speedy repairs, economy, decreased minor claims, less complaint and enhanced public relations.



Tracks in Syracuse, where pavements are kept in smooth condition

*Submitted in ELECTRIC RAILWAY JOURNAL Prize Contest.

Electric Railway Journal Maintenance Data Sheet
ROLLING STOCK—MISCELLANEOUS—13

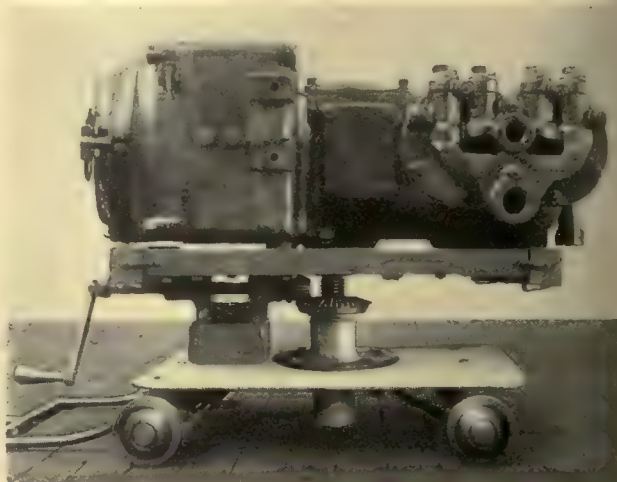
Convenient Type of Compressor Truck*

BY G. R. FANNING

Foreman Pneumatic Section, Hillcrest Shops,
Toronto Transportation Commission, Toronto, Canada

FOR the installation or removal from cars of air compressors, a small truck with roller bearing wheels has been made in the shops of the Toronto Transportation Commission. The body of the truck is a steel plate $5\frac{1}{2}$ in. from the floor; on this is mounted a pedestal $4\frac{1}{2}$ in. high with a $1\frac{3}{4}$ -in. bore which acts as a support and guide for the $1\frac{3}{4}$ -in. screw on which a turntable is fastened. This, in turn, supports the compressor.

The screw has four threads per inch and is operated by a crown gear and pinion, the crown gear turning on ball bearings. The table is raised or lowered by turning a handle at the front of the truck. This truck has reduced the time required to mount a compressor under a car very considerably, and when raised up the truck can be moved easily to the exact position to receive the compressor or to place it back under the car. Also, after a compressor has been removed from a car, it can be taken to the vacuum cleaner or sent to the repair department without any extra handling.



Truck for removing and installing air compressors under cars

*Submitted in ELECTRIC RAILWAY JOURNAL Prize Contest.

Electric Railway Journal Maintenance Data Sheet
TRACK AND WAY DEPARTMENT—11

Machine for Oiling Track Curves*

BY I. O. MALL

Assistant Superintendent of Roadway New Orleans Public Service, Inc.
New Orleans, La.

TO PROVIDE a thorough and a net saving of \$3,500 per year. A efficient means of oiling track curves, the machine illustrated was developed by the New Orleans Public Service, Inc. An airtight oil receptacle is mounted on two wheels and has a pipe extension arm. Air at a pressure of about 20 lb. is supplied to the oil by means of a hand pump attached to the handle. A flexible connection is provided from the pump to the top of the oil receptacle and a valve mechanism at the bottom for regulating the flow of oil is controlled by levers on the handle.

Three men with three of these machines are doing the work formerly requiring nine men, and results in



Track curve oiling machine

is most effective, and the flexible control provided through the air pressure and the operator's control permits uniform lubrication irrespective of temperature conditions which affect the viscosity of the oil.

Due to the simple means of control, accident hazards are reduced, since the operator can give complete attention to traffic movement.

*Submitted in ELECTRIC RAILWAY JOURNAL Prize Contest.

Electric Railway Journal Maintenance Data Sheet

ROLLING STOCK—ELECTRICAL—23

Self-Adjusting Yoke for Bar-to-Bar Test*

BY ARTHUR E. CLEGG

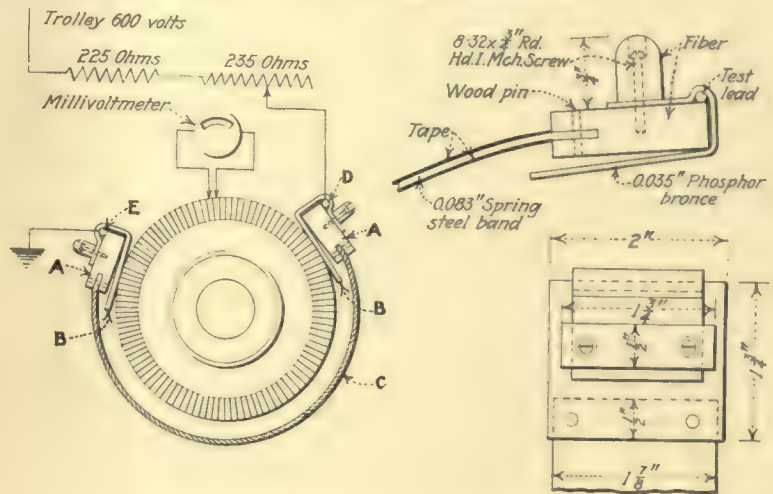
Foreman Electrical Department,
San Diego Electric Railway, San Diego, Cal.

FOR testing armatures by the bar-to-bar method a self-adjusting yoke is used in the electrical department of the San Diego Electric Railway, San Diego, Cal. The accompanying illustration shows the yoke as used with a commutator having 35 bars between contacts.

Two white fiber pieces, marked A in the illustration, support the spring contacts and form a base for attaching the leads through which the series current flows. The spring contacts, B, have sufficient spring action to insure proper contact. The fiber pieces are fastened to a spring steel band designated as C. This band is insulated with oil linen and friction tape and holds the contacts securely on the commutator bars. For various types of commutators having different numbers of bars the steel band is changed. This testing

yoke is connected in the series circuit by leads, D and E, with two steps of resistance, the last step being variable to give different

values of current and provide a convenient deflection on the millivoltmeter. The source of power is 600 volts. With this arrangement an armature can be given a bar-to-bar test without removing it from the frame by taking out the brush-holders and placing the yoke around the commutator.



Self-adjusting yoke for armature bar-to-bar test

*Submitted in ELECTRIC RAILWAY JOURNAL Prize Contest.

Electric Railway Journal Maintenance Data Sheet

ROLLING STOCK—MISCELLANEOUS—11

Testing and Regulating of Thermostats Made Easy*

BY HARVEY L. BULLOCK

North Station, New York Central Railroad,
White Plains, N. Y.

REGULATION of thermostats used in multiple-unit cars of the electric division of the New York Central Railroad is done in a test cabinet that has been constructed by the shop forces at North White Plains, N. Y. This duplicates the conditions of heat and cold which occur in a car and furnishes an easy and accurate means for testing and adjusting these thermostats.

The test cabinet has two chambers, one above the other, each containing about 8 cu.ft. of air. The two are insulated from each other and are provided with glass doors so that the interior is visible from the outside. The chambers are provided with two 100-watt lamps for heating, and the lower chamber is kept cool by an

electrically driven refrigerating machine, the Icemaster, which uses methyl chloride as the refrigerating agent. The pumps and condensing coils of the Icemaster are located on a shelf some distance from the cabinet.

An elevator connects the two chambers of the cabinet. The thermostat to be tested is placed on this and connections are made so that the lower temperature contacts of the thermostat will send the elevator up into the warm chamber and the high temperature contact will operate to return the elevator to the lower chamber promptly. The temperature in each chamber can be adjusted to any given value desired within reasonable limits. The elevator runs on



Test cabinet for the regulating and testing of thermostats

*Submitted in ELECTRIC RAILWAY JOURNAL Prize Contest.

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Electric Railway Journal Maintenance Data Sheet

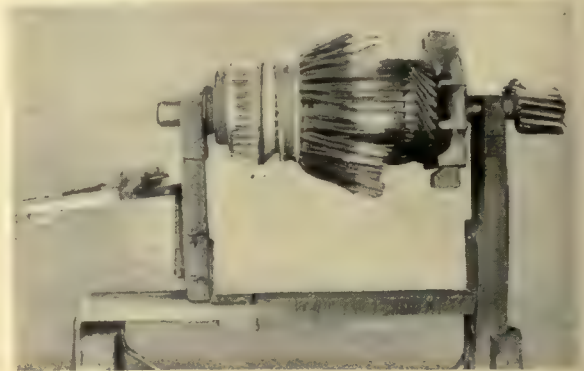
ROLLING STOCK—ELECTRICAL—24

Adjustable Armature Stand*

BY M. S. WALKER

Armature Winder Beaver Valley Traction Company,
New Brunswick, Pa.

AN ADJUSTABLE armature stand that does away with old time stands has been devised by the mechanical department of the Beaver Valley Traction Company. With the several attachments used all armatures are wound speedily. In the construction of this stand two 3 in. x 6 in. x 24 in. long channels are spaced 34 in. apart and imbedded in concrete. A piece of $\frac{1}{4}$ in. x 4 in. channel iron, with a $\frac{3}{4}$ in. slot 18 in. long in the center is placed on top of the 3 in. x 6 in. channels. Then two uprights of 2 in. x 5 in. are cut out. The back one of these is bolted securely to the channel iron. The other is the upright for the front end and has a piece of angle iron $\frac{1}{2}$ in. x $3\frac{1}{2}$ in. x 5 in. with a $\frac{5}{8}$ in. hole drilled in the center. To keep this upright from moving sideways on the channel iron the bottom of the angle that slides on the channel is slotted $\frac{1}{2}$ in. deep and a piece of iron 1 in. x 3 in. x $4\frac{1}{2}$ in., with a hole drilled in the center and tapped out, is placed



Handy type of adjustable armature stand

under the channel. The front upright is on top of the channel and can be adjusted for any size armature.

By use of an extra attachment air compressor armatures can be held in this stand while being wound. The attachment consists of an old DH-16 compressor bearing with the threads turned on the outside. This is put on the standard and the compressor armature of short length is placed on it.

*Submitted in ELECTRIC RAILWAY JOURNAL Prize Contest.

Electric Railway Journal Maintenance Data Sheet

ROLLING STOCK—MISCELLANEOUS—11

Testing and Regulating Thermostats Made Easy*—Continued

two guide rods and is provided with two sealing plates at the top and bottom so that when it reaches the limit of its travel in either direction, both chambers are sealed from each other. The elevator is electro-pneumatically operated by two solenoid valves which control the action of a compressed air supply in a cylinder, the piston of which moves the car up and down. To facilitate rapid change of temperature there is an exhaust fan located at the top of the cabinet and a damper control enables the operator to exhaust either chamber at will.

By regulating the temperature of the room to the required degree and by observing the response of the thermostatically controlled elevator, a graphic and sensitive method of observing the speed and accuracy with which a thermostat responds to prearranged temperature limits is provided. In addition, the operation of the elevator through the rapid alteration in temperature forms a convenient method for testing the thermostat contacts a large number of times and thus assures proper operation in service.

*Submitted in ELECTRIC RAILWAY JOURNAL Prize Contest.

June 18, 1927

ELECTRIC RAILWAY JOURNAL

1094a

5 out of 7

Regularly use "TOOL STEEL"
Gears and Pinions

In the Electric Railway Journal, Maintenance Competition, May 21, 1927, seven articles were submitted from men in Philadelphia, Chattanooga, Atlanta, Washington, New Orleans, Birmingham, and Portland, Maine. Presumably these companies are alert in an effort to keep down maintenance costs.

5 out of 7 of these companies regularly use "Tool Steel" gears and pinions,

and

3 of the 7 companies, when buying new equipment, have specified "Tool Steel" gears and pinions on their new motors.

also

In the April contest (April 16th issue of Electric Railway Journal) 5 out of 6 were submitted by "Tool Steel" gear and pinion regular users.

"Tool Steel" gears and pinions reduce maintenance costs; if you take almost any classification of the "Live Wires" in the industry you will find that the great majority keep down their maintenance costs with "Tool Steel" gearing.

The Tool Steel Gear & Pinion Co.
CINCINNATI, OHIO

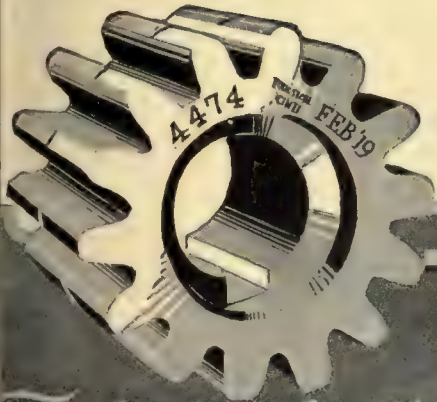
Here's the
monthly
record of
Total rolling
Stock
Articles and
users of
"Tool Steel"
gears

April	5 out of	6
May	5 out of	7
June	7 out of	8
July	4 out of	5
Aug.	6 out of	8
Total	27 out of	34

Out of 34 Contestant
articles, 27 came from
Companies regularly using
"Tool Steel" Gears and
Pinions

79%

THE FIRST CAPITAL PRIZE WINNER IS A "TOOL STEEL" GEAR USER



TOOL-STEEL QUALITY
GEARS AND PINIONS

The Standard of Quality

PROTECT the RAILWAY MOTOR



The well-known enemies of the car motor—moisture and dust, can not penetrate into the windings so long as the insulation remains effective. But when the insulation gets old or brittle the danger of motor failure increases rapidly.

The one effective means of arresting insulation decay is that of periodic renewal by dipping and baking. It not only eliminates the most important cause for motor failures, but it also reduces maintenance costs.

Write for data on this question.

YOUNG BROTHERS COMPANY
6520 MACK AVENUE, DETROIT, MICHIGAN

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807 San Fernando Bldg., Los Angeles
248 Central Bldg. - Seattle, Wash.
10 High St. - - - Boston, Mass.



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INDUSTRIAL OVENS



COLUMBIA

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The Columbia Machine Works and M. I. Co.
265 Chestnut St., corner Atlantic Ave.,
Brooklyn, New York

"American"

Light
and
Heavy
SPRINGS



Advantageous loca-
tion for prompt de-
livery of raw materi-
als—Ample equipment
of modern automatic
machinery and appli-
ances — Pyrometer
equipped furnaces as-
suring accurate, uni-
form heat treatment
and over 35 years'
spring manufacturing
experience constitute
a service which means
satisfaction.

May we estimate on
your needs?

**AMERICAN SPIRAL
SPRING & MFG. CO.**

Established 1887

**ARSENAL STATION
PITTSBURGH, PA.,
U. S. A.**

Electric Railway Journal Maintenance Data Sheet
BUSES AND TRUCKS—7

**Single-Type Tire Chains Reduce Labor
of Application***

BY D. S. MACKAY
Supervisor of Automotive Equipment
Boston Elevated Railway, Boston, Mass.

DURING past winters physical difficulty has been experienced by the Boston Elevated Railway with buses operated with snow chains. To reduce the amount of labor necessary in applying, a single chain is used for 36 x 6 tires. These have snow links made of $\frac{3}{4}$ -in. stock, cross links $1\frac{1}{2}$ in. x 1 in. x $\frac{3}{4}$ in. with full half twist, a hook $\frac{1}{4}$ in. diameter and a locking device of $\frac{1}{8}$ -in. material.

This type of chain provides a perfect fit and the full half twist links laid flat when in contact with the roadbed reduce breakage. The



Single chain used on tires of the
Boston Elevated Railway buses

life of the single-type chain is much greater than the dual chain previously used.

With the single chain it is unnecessary to jack up the rear end of a bus when it is applied and two buses can be equipped with single chains in the time that originally was taken for applying them to one bus. When applied to outside wheels, damage to brake rods, Alemite fittings, fenders and paint are eliminated. The mileage obtained per gallon of gasoline is also increased. The accompanying illustration shows the type of chain used.

*Submitted in ELECTRIC RAILWAY JOURNAL Prize Contest.

Electric Railway Journal Maintenance Data Sheet
SIGNALS—2

Board for Testing Signal Apparatus*

BY W. R. HORNBERGER
Elevated Signal Department, Philadelphia Rapid Transit Company,
Philadelphia, Pa.

SIGNAL apparatus repaired in the shops of the Philadelphia Rapid Transit Company and in use on the subways and elevated lines is tested at a board designed and built by the shop forces. The variety of apparatus to be tested necessitates the use of three different values of current and seven different voltages. A corresponding variety of instruments is necessary. Weston instruments are used and include one 0-25 voltmeter, one 0-1 ammeter, one 0-50 milliammeter, one a.c. model 330 four-scale voltmeter, four a.c. model 155 ammeters.

The board is designed to facilitate the test for manipulation of switches, avoiding all necessary set-ups to prevent conflicting connections. A unique system of interlocking is provided which prevents mistakes and damage to instruments.



Signal test board used in shops of Philadelphia Rapid Transit Company

*Submitted in ELECTRIC RAILWAY JOURNAL Prize Contest.

Electric Railway Journal Maintenance Data Sheet

BUSES AND TRUCKS—8

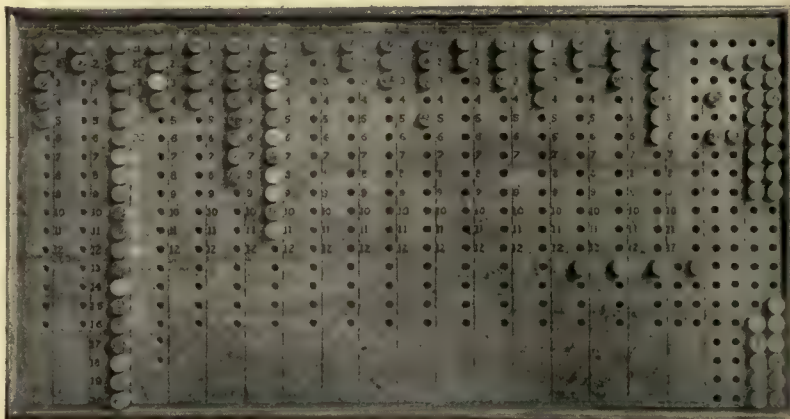
Plug Board Shows Location of Buses at All Times*

By C. B. LINDSEY

Superintendent of Automotive Equipment
Los Angeles Railway, Los Angeles, Cal.

GREAT assistance has been given by the plug board shown in the accompanying illustration, which was made by the engineering department of the Los Angeles Railway. It is used to show the locations of buses at all times. The clerks at the bus garage find its use indispensable in keeping track of the buses.

A plug is provided for each bus, which is numbered accordingly. When a bus is in service the corresponding plug is placed opposite the train run number on the line to which the bus is assigned. The board is divided into columns, a separate column being provided for each line. Buses on hand are kept in the column to the right of the board and are moved to the "O. K." column as they are inspected and reported in good



Type of bus plug boards used by the Los Angeles Railway

order by the foreman. In this way the number of extra buses can be determined at a glance. When trippers go out or replaced by the foreman. In this way the number of extra buses can be determined at a glance. When trippers go out or replaced

ments are made the plugs are moved accordingly, thus avoiding confusion and making it possible to locate any bus immediately.

*Submitted in ELECTRIC RAILWAY JOURNAL Prize Contest.

Electric Railway Journal Maintenance Data Sheet

SIGNALS—2

Board for Testing Signal Apparatus*—Continued

Taps in the upper right-hand corner of the board are connected with air-cooled transformers used in conjunction with the 250-volt, 25-cycle and 110-volt, 60-cycle supplies to provide the lower voltages. Direct current is obtained from a battery line. Fine variation in voltage is obtained by the use of two variable resistance units connected as potentiometers.

Both a.c. and d.c. buses are provided for testing at the board. These may be connected through interlocking switches to the electro-pneumatic

tester. A miniature interlocking machine roller on the board controls the electro-pneumatic switch valves under test.

Interlocking of switches is accomplished by using sliding Bakelite bars placed to intercept the blades of conflicting switches and prevent closing. Six positions on the bars are provided, slots cut in them allowing the proper switches to be closed for each position. On switches mounted horizontally the bar intercepts a pin fastened to the blade. The lever controlling the bar also

acts as a switch with six taps connecting the proper voltmeter across the buses.

Stands to accommodate the several types of relays may be mounted on a turntable, which may also be inclined to facilitate work. The turntable is on the bench directly below the board. The cover for the board, lined with white enamel, serves as a reflector for lamps mounted within the cover, thus providing indirect lighting when in a raised position. When lowered it protects the board and apparatus from dust.

*Submitted in ELECTRIC RAILWAY JOURNAL Prize Contest.

American Association News

Utilities Commissioners Consider Vital Subjects

Valuation, improvement of service, motor bus regulation, insurance and electric railway progress have attention at Dallas meeting

REPRESENTATIVES of regulatory commissions of 38 states attended the 39th annual convention of the National Association of Railroad and Utilities Commissioners, meeting during this past week from Oct. 17 to 21 in Dallas, Tex. Reports of committees and addresses covering a wide range of problems connected with the equitable regulation of public service companies occupied the attention of the convention. Among these were a number of subjects of direct interest to electric railway men. A report of the committee on valuation presented by Hon. Fred Woodruff of Iowa was followed by an address on this subject by Hon. W. A. Prendergast of the New York Public Service Commission, who stressed the need for agreement on an economically sound basis of determining utility values. He urged that regulatory bodies assume the responsibility for initiating and promulgating a sound and uniform basis of determining fair value, instead of leaving this important subject to legislative determination. Where, he said, it would be approached not on an economic, but on a political basis.

W. W. Atterbury, president Pennsylvania Railroad, called attention to the vast expenditures being made by the railroads of the country for the improvement of service. This progressive policy, he declared, can be continued only if the public will maintain fair treatment and permit a fair return for the capital being thus expended for public service.

MOTOR VEHICLE SITUATION CONSIDERED

Motor vehicle common carriers came under consideration in the report of the committee on motor vehicle transportation presented by Hon. Amos A. Betts of Arizona. The report outlined the rapid growth of this new form of transportation and urged the need for adequate regulation that would protect the investments of responsible operators and the interests of the public. Hon. J. E. Benton, general solicitor of the association, outlined the status of the matter of federal legislation of interstate buses. Action on this subject, he said, is awaiting the completion of the report being prepared by the Interstate Commerce Commission based on its study of the problem of motor transportation throughout the country. When the Interstate Commerce Commission's

study is completed, Mr. Benton predicted, the representatives of the state commissions expect to co-operate with that body in the final recommendation of the principles upon which interstate vehicle regulation should be based.

S. A. Markel, representing the Motor Bus Division of the American Automobile Association, expressed the views of his organization on this subject. He said that bus operators are in favor of the regulation of interstate passenger carriers, but favor the elimination of trucks from proposed legislation. This regulation, they maintain, should be delegated through federal authority to the respective states. Mr. Markel added that the next step in handling the motor bus problem would then be to secure uniform regulatory laws in the various states.

Another phase of the motor bus question, that of sound insurance, was discussed in an address by H. S. Ives, vice-president Casualty Information Clearing House, Chicago. Contrary to the general impression among bus operators, according to Mr. Ives, insurance rates on buses are fixed by the operators themselves through the accident record which they establish. The speaker decried the tendency on the part of some bus men who object to the present excessive high rates of insurance, to urge

assumption of insurance activity by the state, and held that any step in the direction of government insurance is a blow at the entire business and industrial structure of the nation.

Lucius S. Storrs, managing director of the American Electric Railway Association, addressed the convention on the status of the electric railway industry. He called attention to the significance of the recent Cleveland convention in demonstrating the rapid progress which the electric railways of the country are making in meeting present-day transportation needs. Electric railways, said Mr. Storrs, are keenly alert to their responsibilities to the public, and are exerting their utmost effort toward the improvement of service and co-operation with local and state regulatory bodies. To carry out their objectives and their proper place in the life of the modern American community, however, they must be granted rates of fare which will produce a fair return on the capital invested in this basic industry. That there is a growing tendency on the part of the public to recognize the needs of electric railways is evidenced, according to Mr. Storrs, by the gradual rise in electric railway fares. He held that a maximum fare of 10 cents is entirely justified for electric railway service and cited that this rate is in effect in 214 cities of the 313 having a population of 25,000 and over.

Other committee reports of interest to electric railways included the work of the committee on statistics and accounts of railroad companies, public ownership and operation, uniform regulatory laws, statistics and accounts of public utility companies, and the report of the committee on public relations.

MR. WELLS CHOSEN PRESIDENT

The association elected as its officers for the ensuing year: H. G. Wells of Massachusetts, president; L. E. Gettle of Wisconsin, first vice-president; Charles Webster of Iowa, second vice-president. It also re-elected J. B. Walker of New York as secretary; J. E. Benton of Washington, general solicitor, and C. S. Bailey, Washington, assistant secretary.

Glacier National Park in Montana was selected for the next annual meeting, to be held on Sept. 10, 1928.

Central Traffic Men to Meet Nov. 16-17

FORT WAYNE, IND., has been selected for the next meeting of the Central Electric Traffic Association, which will meet at the Keenan Hotel on Nov. 16 and 17. The first day's session will be called to order at 9 a.m., Central time.

COMING MEETINGS

OF

Electric Railway and Allied Associations

Oct. 26-27—Public Utilities Association of West Virginia, annual convention, Parkersburg, W. Va.

Oct. 26-27—Society Automotive Engineers, Transportation Section meeting, Hotel Sherman, Chicago, Ill.

Nov. 2-3—Iowa Electric Railway Association, operating and maintenance sections, annual convention, Blackhawk Hotel, Davenport, Iowa.

Nov. 4—Metropolitan Section, American Electric Railway Association, Engineering Societies Building, 33 West 39th Street, New York, N. Y.

Nov. 4—American Institute Electrical Engineers, New York Section, Engineering Societies Building, New York City.

U. S. Chamber of Commerce Has Four-Day Meeting

PURSUANT to a new plan, about 400 members of the U. S. Chamber of Commerce met at West Baden, Ind., over last week-end for a four-day meeting, packed with the sessions of committees, councillors and members of the board of directors. The sessions closed Oct. 18. Of first importance were reports on Mississippi flood control, tax reduction and a new civic objective for business. Additional subjects covered in general meetings were a project for getting out the vote at elections, reduction of postal rates, maintenance of the integrity of the Federal Reserve System, self-regulation by business, the part played by member organizations in legislation, and the relation of these organizations to the public and the press. Twenty different committees held meetings, reviewed the progress of their work, and, where advisable, laid out new plans. As always at U. S. Chamber of Commerce meetings the attendance included a large number of the leaders of American business, both from industry and trade. General judgment was that this new plan of grouped committee and national councillors meetings was a success, enabling all groups sharing in the chamber's work materially to advance their activities.

Mississippi flood control was presented through addresses by Lewis E. Pierson, president of the chamber; John M. Parker, former Governor of Louisiana, and through a report of the chamber's flood committee, headed by Frederick A. Delano. The report was ordered to be made the basis for referendum to chamber members. It recommends "(1) that the federal government should hereafter pay the entire cost of constructing and maintaining the works necessary to control the floods of the lower Mississippi; that is, from Cairo to the Gulf; (2) that the federal government should assume the sole responsibility for locating, constructing and maintaining such works; (3) that there should be an adequate appropriation to insure efficient, continuous and economic work, the funds to be made available as needed; (4) that flood control on the Mississippi is a work of such magnitude and urgency that it should be dealt with in legislation and administration upon its own merits, separate and distinct from any other undertaking."

In tax reduction the chamber is now asking member organizations to vote on a suggestion that the corporation income tax be reduced from 13½ per cent as now to 10 per cent. The chamber's committee, as already announced, asks a total tax reduction of \$400,000,000. Reductions advocated include the abolition of the federal inheritance tax and excise taxes imposed as war measures.

The committee on postal service advocated the elimination of the higher rates made effective in 1925 on private mailing cards and circular matter, and also war rates on advertising in magazines and newspapers. This committee showed that the Post Office Department

has lost revenue through these increases and that the existing rates are handicapping business.

Harry A. Wheeler, president of the Union Trust Company, Chicago, discussed the benefits of the Federal Reserve System and urged strong defense of the system by business. Improvements are to be expected by fundamentals should not be altered.

Judge Edwin B. Parker, chairman of the board of directors of the chamber, advocated regulation of business by itself, asserting that if it does not do so the government will. He commended the helpful attitude of the Federal Trade Commission in desiring to assist business to work out rules of business conduct in the interest of business itself, but in a manner to safeguard the interests of the general public.

In closing the session, President Pierson pointed out that the national councillors present had a grave responsibility, for on them rested the task of taking back to their organizations the problems studied by the chamber and there creating that informed public opinion which will bring its influence to bear on government for the common welfare.

American Association News

Side Wear on Brushes in Ventilated Motors

THE following report of special committee No. 8, Rolling Stock Division A.E.R.E.A., was received too late for publication in the report number of *ELECTRIC RAILWAY JOURNAL*.

Observations are being made on a number of railway properties to determine the effect on brush life of changes made in ventilated railway motors. Various schemes of ventilation have been worked out and data are being collected on these motors to find a means of obtaining increased life of the carbon brush without increasing commutator wear.

Side wear of carbon brushes was known before the advent of the ventilated railway motor. In such instances where it occurred in the totally inclosed motor it was no doubt due to high current density in the brushes, the erosion of the sides of the brush being caused by incipient sparking from brush to carbon box. In such instances the pigtail-ing of the brush was beneficial. Side wear of brushes has not been a serious factor in the series ventilated railway motor, this no doubt being due to the fact that the air enters the motor at a low velocity and not very large volume and the intake is at the pinion end.

With the development of the multiple ventilated railway motor, where the air enters at the commutator end, one stream of air passing across the field coils and the outside of the armature and the other stream of air flowing through the

armature, it has been found that the life of the carbon brush has been materially shortened. It was quite some time before it was definitely determined that the side wear of brushes was caused by dust, which, entering with the ventilating air, lodges between the carbon brush and the carbon box and, acting as an abrasive causes side wear of the brush and roughens the brush surface of the carbon box.

There may be instances where side wear of brushes in multiple ventilated motors is due to methods of taking current from the brush, causing sparking as referred to above in reference to the totally inclosed motors.

The following tests showed conclusively that dirt was the cause of side wear of brushes:

On a four-motor, 35-hp. equipment where side wear of brushes was very bad, the fourth motor on a car was cut out of the electrical circuit, new brushes placed in all four motors and the car put back in service operating on three motors. An inspection weeks later showed that the brushes in No. 4 motor had just as much side wear as the brushes in either of the other motors.

Another test was made by insulating the carbon box from the brush-holder, body current being taken from the brush by means of a pigtail and also through the brush-holder pressure arm. Results of tests showed that brushes in the special insulated carbon boxes had just as much side wear as did the brushes in the standard holders. Tests have shown that if movement of the brush in the carbon box can be eliminated or dust kept out of the motors, side wear of brushes will be negligible.

Inclosed brush-holders have been very effective in reducing the side wear of brushes; the objection to this construction is on account of additional maintenance of the covers, also on account of difficulty of inspection.

During the past two or three years manufacturing companies have made very extensive tests both in service and on the test stand to find some means of obtaining better brush life, and results of service indicate an increase of from two to ten times the life previously obtained.

Operators endeavoring to improve brush mileage should be careful not to do so at the expense of their commutators. Of first importance is the selection of a brush that will polish the commutator, thereby reducing the number of broken brushes and the flashing over of motors. A brush that does not polish but etches and roughens the commutator will not ride smoothly and will be bounced from the commutator when the car, traveling at high speed, hits special work or raised rail joints, resulting in flashing over of commutators.

The proper spring pressure on the brush is a prime requisite to successful performance of the motor and this value is dependent on the condition of track, speeds operated and the weight of the equipment.

The brush-holder spring pressure should be maintained so as to keep the brush on the commutator at all times.

News of the Industry

Grand Rapids Rejoices in Coffin Award

Grand Rapids, Mich., was given an opportunity on Oct. 13 to show its appreciation of the honor conferred on it by the recent awarding of the Charles A. Coffin Prize to the Grand Rapids Railroad. The occasion was a dinner given by Gay H. Hollister, president of the National Bank, at the Hotel Pantages, and the honor guests were Louis J. DeLamar, vice-president and general manager, and his associates of the winning company.

Mr. Hollister lauded the rehabilitation of the local lines, which he termed the greatest contribution toward putting the railway systems of the country back in the category of staple utilities. Attorney Stuart E. Knappen described the difficulties of securing a rise in fares and of working out the present franchise terms following the critical post-war period. That Mr. DeLamar was able to obtain the co-operation of the city administration and the general public in the face of such handicaps was termed an achievement of exceptional merit. In reviewing the history of the organization Mayor Swarthout expressed his joy that the city and railway were able to combine their efforts to bring about such desirable results.

General Manager DeLamar, in expressing his appreciation eulogized the city government, newspapers and the public in bringing about a better understanding of what the city transportation agencies were doing. He disclaimed all personal credit for the award, giving the credit to his workers in the field.

The reasons back of the astounding success of this comparatively small railway serving a population of approximately 160,000 were enumerated in the *ELECTRIC RAILWAY JOURNAL*, issue of Oct. 5, 1927, pages 728 to 738.

Boston Employees Charge Discrimination in Wage Settlement

The employees of the Boston Elevated Railway, Boston, Mass., all members of the Amalgamated Association, have brought suit against the company in the Superior Court claiming they are discriminated against in the recent wage increase granted by the Boston Elevated Railway. The men, who are primarily employed as truck drivers, air compressor men, track operators, stablemen and teamsters, have asked in a bill of equity that the railway and officials of the union be enjoined from putting into effect a new wage scale and hour scale.

The nine employees claim executives were influenced in leaving them out of consideration through pressure brought

to bear by the International Brotherhood of Teamsters, Chauffeurs, Stablemen and Helpers, and the International Union of Steam Operating Engineers. These two organizations, it is claimed, sought to bring their various positions under the control of the two orders.

The Boston Elevated Railway is said to be willing to include the nine men in the new contract, but intends to enter into a contract with the other two unions. The men say they will be unable to get work elsewhere without joining the two unions named, and are anxious to have the benefits of the Amalgamated. They seek to void the working contract recently enacted and have it made over to include their work. The case will be heard Oct. 25.

Birthday Surprise for T. N. McCarter

On the occasion of his 60th birthday on Oct. 20 Thomas N. McCarter, president of the Public Service Corporation of New Jersey, was given a surprise party by 1,000 employees. A bouquet of American Beauty roses was presented to him by John Craig of Rutherford, N. J., who has a service of 35 years with the company.

When Mr. McCarter rose to accept the gift the chair in which he had been sitting became a luminous representation of a birthday cake, lighted with 60 electric bulbs and embellished with the seal of the Public Service Corporation.

Jitney Ordinance Constitutional

Supreme Court hands down decision eliminating jitneys from route of Detroit Street Railway. Five-year controversy ended. Municipal Railway must care for added patronage

THE United States Supreme Court dismissed the appeal of the Red Star Motor Drivers' Association to have the Detroit ordinance regulating jitneys declared unconstitutional, thus ending a five-year battle to drive the jitneys off the street. Although the formal court decision has not been received by the Detroit city officials, they were notified on Oct. 17 that the Supreme Court had held that it was without jurisdiction, no federal question being involved. The validity of the ordinance had previously been upheld by the State Supreme Court of Michigan.

It has not been announced what the city's next step will be, but it is unlikely that any action will be taken to oust the jitneys until after an official copy of the court decision has been received. Edward N. Barnard, attorney for the jitney drivers' association, stated that he would start at once to fight for a rehearing before the Supreme Court. Members of the City Council were of the opinion that the matter of ousting the jitneys from the streets of Detroit rested with Mayor John W. Smith, and decision is being withheld by the Mayor until Corporation Counsel O'Neil has had an opportunity to go over the court decision. The Mayor has announced that he will be governed by the opinion of the Corporation Counsel.

The finding of the United States Supreme Court was anticipated when the court declined to hear further arguments in the case. Additional briefs were to have been filed both by the

city attorneys and attorneys for the jitney drivers. The case was advanced on the docket to first position after the city of Detroit sought its immediate dismissal early last spring.

The case was brought to the high court on a writ of error by the jitney drivers, against the decision of the Michigan Supreme Court. The Michigan Court had upheld the constitutionality of an ordinance which, in effect, would have barred the jitneys from main Detroit thoroughfares and dismissed an injunction issued in the Wayne County Circuit Court restraining the city from ousting them. While the case was pending before the United States court the State Supreme Court issued an injunction restraining the city from acting pending a final decision.

This so-called "jitney ordinance" bars jitneys from operating on Woodward, Jefferson and Grand River Avenues and on Fort Street, and proposes substitute routes which, it was cited in the brief filed in the case, are longer and involve many sharp turns. The ordinance was held unconstitutional by Wayne County Circuit Judge Ormond F. Hunt, and his decision was reversed by the State Supreme Court in a divided decision.

It was the contention of counsel for the jitney drivers' organization that the ordinance violates the Fifth and Fourteenth Amendments to the Constitution of the United States in that it causes serious discriminations and would result in confiscation of property without due process of law. It was

further claimed that in barring jitneys from streets where buses, street cars and taxicabs were permitted to operate the ordinance became class legislation.

A survey is being made by Del A. Smith, general manager of the Detroit Department of Street Railways, to determine whether the city department has transportation facilities available at present to care for the passengers carried daily by the jitneys. It is estimated that the ousting of the jitneys will add 35,000 passengers to the Detroit street railway traffic daily and that the jitney riders will bring an additional revenue of \$3,000 per day.

The first of the 125 new street cars ordered by the Department of Street Railways has arrived and others are to arrive at the rate of eight per week. It has been stated that the new cars will more than care for the additional patronage due to the proposed ousting of the jitneys and that the Detroit United Railway has offered to rent cars to the city. The new express service which was recently put in effect on Jefferson Avenue requires the use of numerous city buses and the survey is being made to determine whether more equipment would have to be purchased to handle the additional passengers now making regular use of jitneys.

The various steps in the jitney controversy in Detroit have been covered in the *ELECTRIC RAILWAY JOURNAL*. It was said editorially in these pages last year that the management of the municipal railway had been embarrassed beyond measure by the unrestrained jitney competition, which in 1925 mulcted the revenues of the municipal system to the extent of more than \$1,000,000.

South Jersey Desires Trolley Back

Residents of several towns below Gloucester in New Jersey recently appealed to the Board of Public Utilities Commissioners of New Jersey to require the Public Service Railway to restore railway service to those towns. The company abandoned its service below Gloucester in August of this year because of the alleged unsafe condition of the bridge over Big Timber Creek. In its place a fleet of buses was substituted. It is the claim of the people that bus service is entirely inadequate.

Handy Folder Gives Milwaukee Rail and Bus Schedules

A complete time-table, effective Oct. 10, is included in the fourteen-page booklet of the Milwaukee Electric Lines, Milwaukee, Wis. It includes service schedules in force on the lines of the Milwaukee Electric Railway & Light Company, the Milwaukee Northern Railway and the Wisconsin Motor Bus Lines. In addition, some general information is included and some helpful hints for the traveler.

Comment Continues on New York's Transit Problems

Reports, findings, opinions, hearings and hearsay on New York City's transit difficulties and developments continue to receive more than a little share of public comment and publicity in the newspapers.

Some new angles to the whole story include the publication on Oct. 19 of a legal opinion, written by William D. Guthrie, president of the New York City Bar Association; Nathan L. Miller, special counsel for the Brooklyn-Manhattan Transit Corporation, and John W. Davis, former Democratic candidate for president, in collaboration with Rushmore, Bisbee & Stern, holding that the city of New York may not recapture the lines of the Brooklyn-Manhattan Transit Corporation for from eight to ten years. In answer to this, Samuel Untermyer, the Transit Commission's special counsel, decided against further conferences with the Brooklyn-Manhattan Transit Corporation until after the city has taken steps to recapture the city-owned portions of the Brooklyn-Manhattan system.

Another happening in the transit situation was the reappearance on the scene of Major Charles E. Smith of St. Louis, who a few weeks ago submitted his report on the transit survey of New York City. He announced his willingness to appear unconditionally as a witness at the Transit Commission hearing conducted by Samuel Untermyer. He supplemented his interview with Comptroller Berry by a statement which had arrived in the mail from St. Louis giving his answer to ten questions on transit problems asked by the *World* following publication of the draft of his report.

Just prior to these developments there had been the statement that the Transit Commission would proceed at once to prepare a transit readjustment plan based on the recommendations of Mr. Untermyer, and would hold public hearings as soon as possible to enable it to present the plans to the Board of Estimate and the traction companies with a minimum of delay. Following this announcement came word that Comptroller Berry had offered to ask Major Smith to return to testify before the commission in explanation of his readjustment plan report. The next point of interest was the appointment of a non-partisan advisory committee of distinguished citizens to confer with the Transit Commission, city authorities and traction companies in an effort to reach the solution of these transit problems, which was urged by the Merchants Association.

On Oct. 18, with the active support of Mayor Walker, the Board of Estimate, meeting in committee of the whole, voted to put \$20,210,000 for subway construction in the 1928 budget as the first step in the plan of John H. Delaney, chairman of the Board of Transportation, to preserve the 5-cent fare in the new city subway system by paying part of its cost out of taxes, thus

lessening the interest charges and making them that much nearer self-supporting at a 5-cent fare.

Ten Cents in Binghamton

A 10-cent cash fare, four tickets for 30 cents on its two operating zones, known as the City and the Endicott zones, were allowed the Binghamton Railway, Binghamton, N. Y., in an order of the Public Service Commission dated Oct. 7. The receiver, William H. Riley, was authorized to put the desired rate into effect on Oct. 16 and to continue them until June 30, 1929, and thereafter until otherwise ordered. Sale of tokens on all cars in each zone was included in the order. The Binghamton Railway now charges a 7-cent fare in each zone.

The commission's decision fixed the value of the property of the railway, upon which it was entitled to a return at \$3,000,000, and the rate of return to the company indicated under the new fare rates will be 8 per cent.

The Binghamton line has been in the hands of a receiver since 1918 except from Feb. 23, 1924, to Oct. 25, 1924. In 1919 the company asked for a 6-cent fare. After controversies with the receiver over franchise conditions this was allowed until Jan. 12, 1925, when the company, the receiver having been temporarily discharged, asked for a 7-cent fare with a 10-cent fare between Johnson City and Endicott and a round-trip fare of 15 cents. The city again waived any franchise conditions and the commission authorized a 7-cent fare. Notwithstanding the increase, the company again went into a receivership on Oct. 11, 1925.

When Receiver Riley asked for a 10-cent cash fare, the city protested to the jurisdiction of the commission. The city secured a writ restraining the commission from acting upon the receiver's application during the proceedings of the Supreme Court which were terminated recently when the Court Appeals held that the Public Service Commission had jurisdiction.

Suggestions Invited Through Portland Press

In each of the four daily newspapers of Portland, Ore., namely the *Oregonian*, *Journal*, *News* and *Telegram*, display advertisements will appear each week for a period of three months dealing with modern transportation in that city. The purpose of the Portland Electric Power Company in placing these advertisements is to invite its patrons to read and study the messages, and from this information to know something of the various phases of modern transportation service, both electric railway and bus. The company is inviting suggestions and it is through this medium it hopes to win the frank and honest opinions about important questions. Constructive criticisms which can be practically applied will help the company and give traveling public better service.

Cy Ownership in Chicago a Possibility in New Lisman Offer

A revised plan for the solution of Chicago's transit problem, providing for the immediate construction of an independent combined subway and elevated system and for acquisition of ownership by the city on terms reasonable and satisfactory to the city, was recently proposed to Mayor Thompson and Alderman Joseph B. McDonough, chairman of the local transportation committee, by John M. Harlan, attorney for the F. J. Lisman interests of New York. As outlined in Mr. Harlan's letter, the new plan provides for the purchase of the Surface Lines' properties by the Lisman interests and for the immediate transfer of these properties to the city, in consideration of a lease to the company to operate them. Later, it is pointed out, the elevated lines can be acquired, while subway construction could start at once.

"If the city will grant the Lisman plan, ordinance to a company organized by its clients," Mr. Harlan declared, "that company, after it acquires the tangible properties of the surface lines, executes its mortgages, issues its securities and exchanges some of them for those of existing companies, would, when requested by the city, give and transfer to the city all these tangible street railway properties." Legal ownership by the city, which is made possible by this plan, Mr. Harlan added, would mean an estimated saving in taxes of \$3,600,000 a year and would do away with the possibility of interference in control by the Illinois Commerce Commission, inasmuch as that body's act expressly excludes city-owned public utilities from commission jurisdiction.

The original Lisman plan, as presented to the City Council last November and subsequently drafted into ordinance form, provided for the return of the surface lines and the subway system to the city of Chicago for \$1 at the end of 30 years operation. This was to be accomplished by retiring all obligations through the operation of a sinking fund.

Anchor St. Louis-Kansas City Application Filed

The St. Louis-Kansas City Short Line Railroad has filed a new application with the Missouri Public Service Commission for a certificate of convenience for the construction and operation of an electric interurban line from St. Louis to Kansas City, Mo. Such a permit has been sought since January, 1925.

The commission denied the original petition on the ground that the company had not made adequate showing of its financial ability to carry through the project. The company then went to the Cole County Circuit Court and later to the Missouri Supreme Court. This appeal was dismissed in the Supreme Court a few weeks ago.

The proposed line would cost \$55,000,000, according to the estimates of its promoters. Surveys, franchises and

right-of-way already secured are listed at a valuation of \$20,000,000, while expenditures made to date total \$26,000. The former application was vigorously opposed by the steam railroads operating between St. Louis and Kansas City. They contended that the towns traversed had adequate service.

St. Paul Fare Hearing on Nov. 1

The city of St. Paul, Minn., will ask for a lower valuation of the property of the St. Paul City Railway at the hearing of the company's application for a higher rate of fare before the Minnesota Railroad and Warehouse Commission. E. W. Bemis and other traction experts have the case under preparation. The hearing was set for Oct. 24 and postponed to Nov. 1.

The voters on Sept. 8 failed to pass a charter amendment which would have enabled the city to offer the railway relief from paving between tracks and other charges to offset the low return on its investment. The present rate in each city is 8 cents cash or six tokens for 40 cents. Corporation Attorney A. A. Stewart has as yet not agreed to such a retaliatory measure as action to banish the company's buses from the streets because operated without franchises or to compel the company to pave between tracks for 16 miles, which would cost \$800,000. Details of the company's petition were given in the *ELECTRIC RAILWAY JOURNAL*, issue of Sept. 17, page 536.

Illinois Traction Will Co-operate to Serve Football Fans

Tariff information concerning several of the important football games has been released by the Illinois Traction System's traffic department. For the Illinois-Michigan game and annual homecoming, Oct. 29, a rate of one fare for the round trip from Illinois points and St. Louis to Champaign-Urbana is authorized good going and returning on Oct. 29. A rate of 1½ fare for the round trip is authorized for the same game going Oct. 28 and 29 with final return limit to leave Champaign not later than midnight Oct. 30.

For the Illinois-Chicago game and Dad's day, Nov. 12, the one-fare, round-trip rate is in effect good going and returning Nov. 12, and the rate of 1½ fare for the round trip going Nov. 11 and Nov. 12 with final return limit to leave Champaign not later than midnight Nov. 13. The minimum fare for both games is \$1.

Piedmont & Northern Railroad Will Renew Efforts to Extend

The Piedmont & Northern Railroad is prepared to continue its efforts to extend its lines in North Carolina and South Carolina before the Interstate Commerce Commission until the full commission has had an opportunity to vote on the proposal. Officials of the line have made this announcement.

Five-Cent Increase on Penn-Jersey Route

An increase in fare from 15 cents to 20 cents has been put in effect on Route No. 5, operating between Philadelphia and Moorestown, by the Penn-Jersey Rapid Transit Company, operated by the Philadelphia Rapid Transit Company. The old rate was 15 cents per zone. This will make the minimum fare on the line 20 cents.

Increase Rates on Illinois Lines

Fares on the Illinois lines of the Tri-City Railway, operating in East Moline, Moline and Rock Island, Ill., were increased Oct. 15 from seven tickets for 50 cents and fifteen for \$1 to three for 25 cents, with the 10-cent casual fare basis retained. Children's fares were raised from 4 cents to 5 cents. Efforts to win a higher fare date back to 1925, when identification cards were discontinued.

Garden Club in Portland

A large and well-organized Garden Club is the latest idea of Bill Strandborg, the ever-progressive publicity agent of the Portland Electric Power Company, Portland, Ore. He believes that within the personnel of the company are hundreds of experienced and enthusiastic flower growers who might capitalize on their knowledge and the wonderful opportunities afforded in the territory of Portland for plant development. Annual contests for trophies, flower show exhibitions, improvement of individual gardens, comforts for hospital patients, even improvement of the landscaping values of the company's properties—all such objectives might be worth the carrying out of the idea. All those who are interested have been asked to send names, addresses and names of departments to publicity department.

Eight Cents Sought in Allentown

The Lehigh Valley Transit Company, Allentown, Pa., has petitioned the Pennsylvania Public Service Commission for permission to charge an 8-cent fare. The present rate is 7 cents.

Season for Learning Opens in Boston in November

In a ten-page pamphlet the educational program of the Boston Elevated Railway, Boston, Mass., is set down with a foreword to all "L" employees announcing the opening of the fifth season of the company's educational plan. As last year, the season will cover practically the five months from Nov. 1 up until March 31.

The 1927-1928 program includes the continuation and repetition of some popular courses and the introduction of two or three new ones. Such subjects as "making the most of one's personal resources," "woman's interests," "caring for automobiles, buses and trucks" and

"investing one's funds" are listed. A popular course in every-day law is especially recommended. The schedule has been arranged so that an employee willing to devote an evening a week to mental improvement, relaxation and good-fellowship can get a variety of opportunities.

Service Annuity Plan for Alabama Workers

A service annuity plan has been authorized by the board of directors of the Alabama Power Company, Birmingham, Ala., effective Oct. 1, which makes provision for all employees incapacitated by age and whose service records entitle them to recognition by the company. The company has heretofore made provision for death benefits through the Group Insurance Plan. The Alabama Power Company operates 89 miles of line, including the systems at Anniston, Gadsden, Huntsville, Montgomery, Sheffield and Tuscaloosa.

Ten Cents in Holyoke

The Holyoke Street Railway, Holyoke, Mass., was authorized by the Public Utilities Department Oct. 20 to increase cash fares from 6 to 10 cents. At the same time the department ordered a readjustment of the rate schedule so that residents of Chicopee and Chicopee Falls may ride between those points for a single fare instead of two fares, as proposed in the company's schedule.

Baltimore Appoints Counsel in Fare Hearing

Mayor William F. Broening of Baltimore has announced that the city will be represented by Simon E. Sobeloff, who has just been appointed Deputy City Solicitor, at the hearing on the application of the United Railways & Electric Company for a permanent 10-cent fare. The hearing will open on Oct. 27 before the Maryland Public Service Commission.

Trained Musicians Hail from Pittsburgh

Whether it be symphony, operatic selection or just plain jazz, the band of the Pittsburgh Railways, Pittsburgh, Pa., is doing a real job, and if it had not won a name for itself in its own city, it surely established itself as an institution at the recent American Electric Railway Association convention in Cleveland. Returning delegates are loud in their praise of the band, which attracted throngs to the Esplanade every day to hear its concerts.

This organization of 40 musicians,



J. B. Donley

who play under the leadership of Alois Hrabak, is composed entirely of employees of the Pittsburgh property. Great credit for the excellence of the band is due to Conductor Hrabak himself, who worked with untiring effort to bring the band to the popularity it enjoys today. But back of all this success is the dogged determination of Joseph B. Donley, director of public relations of the Pittsburgh Railways, who acts as manager of the organization, which is considered part of his department. Mr. Donley is the up-and-doing, progressive type that will bring to this organization the credit it deserves. The musicians themselves have

taken a great interest in its success, devoting each Thursday night after a hard day's work to the practice of their various numbers.

Port Arthur Council Shows Faith in Utility

In response to a communication J. G. Holtzclaw, manager of the East Texas Electric Company, requesting that an extension of time be granted that company for concluding the transfer of the interests of the Port Arthur Traction Company, Port Arthur, the City Council granted an indefinite extension of time. In his letter Mr. Holtzclaw said that he was quite sure that the people of Port Arthur desired a transportation system which would adequately fill the needs of a growing city. He was quite sure that the Council would carefully weigh any position which might be put to furnish transportation to the city.

P. R. T. Men Don Naval Type Caps

More than 6,000 trainmen and supervisors of the Philadelphia & Delaware River Transit Company, Philadelphia, blossomed forth in new naval type caps on Oct. 15. The caps are similar to those used by commissioned and uncommissioned officers of the navy, being of a dark blue felt with a semi-flexible crown. This headgear is more comfortable and of longer life than the winter headgear formerly standard on the system. An advantage lies in the fact that the new cap will be usable the year round, while the old cap has hitherto been necessary for men to purchase not only a felt cap for winter use but a straw headgear for warmer weather.

The supervisors—men who are on the streets day and night to maintain order and to handle emergency transportation conditions—will have a new cap to be worn at the front of the cap above the visor. Trainmen's badges will be unchanged.



Strike up the Pittsburgh band

Recent Bus Developments

Votes to Deny Indianapolis Bus Purchase

The Indiana Public Service Commission, at a special meeting Oct. 14, voted not to change its order denying the Indianapolis Street Railway permission to buy the stock of the Peoples Motor Coach Company for \$500,000. This means that the transcript of evidence heard by Circuit Judge Harry O. Chamberlain, Indianapolis, on the appeal of the car company against the commission's order, will be returned to the court and Judge Chamberlain will rule upholding or reversing the commission's order. The commission twice has refused the merger on the grounds the \$500,000 was too high a price for the bus company. Under the last utility legislation, the car company appealed to the Circuit Court. Transcript of the court testimony was sent to the commission so that it might change its order, if it desired, before the court acts. The communication to the court pointed out that the car company still intends paying 8 per cent interest for \$50,000 it must borrow to purchase the bus company and declared that while the bus company made \$6,493 in the first seven months of 1927 the history of the railway did not indicate it could operate the bus lines and make a net profit above interest charges on the purchase price.

Tramway Would Run Desired Line in Denver

Business men of Denver, Col., have asked the city officials to sanction a bus route from the Union Depot up Eighteenth Street to the outer edge of the city. The Denver Tramway shows a willingness to operate the buses and intimates that if the project is sanctioned it will issue transfers between the buses and its cars with a fare of about 10 cents. The carfare now is 8 cents or two tickets for 15 cents. The Denver Tramway operated cars up Seventeenth Street to the outer edge of the town some 6 or 7 miles, but abandoned the service on Eighteenth between the Union Depot and Broadway about two years ago.

Railway Would Prevent Bus Interference in Indiana

Suit for an injunction to prevent the Marion-Fort Wayne Motor Coach Company of Indiana from operating a bus between Fort Wayne and Waynedale, Ind., until authority has been secured from the Indiana Public Service Commission has been filed in the Circuit Court at Fort Wayne by the Indiana Service Corporation, railway operator in that section. The bus company has not the authority to carry passengers between Fort Wayne and

Waynedale, the complaint alleges. The Indiana Service Corporation does have authority to carry passengers between these two points.

Buses to Serve on Certain Connecticut Runs

The Connecticut Company will cease operation on the Green line between Waterbury and Milldale, Conn. It is proposed to continue this line only between Waterbury and the Mountain. The New England Transportation Company, a bus subsidiary of the New

Comforts of the Auto

STREET cars are being built with automobile trimmings, according to report from the American Electric Railway exposition, in order to lure back their rapidly deserting patronage. New cars are to have tilting seats, upholstered in leather, vestibules built on windshield lines and motor horns in place of gongs.

This may be a good beginning, but still it is hardly enough to make the confirmed autoist feel at home in a street car. Before this is accomplished it will be necessary to put a number of bumps in car tracks and lower the roof of cars so that passengers can crack their domes against the top every once in a while. Another improvement should be the removal of straps so that passengers will be required to sit in one another's laps. This will appeal particularly to the high school and college trade.

Then it should be arranged that, at stated intervals when the car is bound toward town with a load on the way to work, it will blow a tire and the passengers will have to get out and help the motorman change it.

There should, by all means, be a parking problem created to give patrons a real sense of having driven down in their own cars. It ought to be arranged that each street car, upon arriving at the downtown section, must drive around the block at least six times before finding a place to stop, where passengers may alight.

It would also help further the illusion if the cars can be saturated with an aroma compounded of the smells of exhaust gas, hot oil and burning rubber.

When these reforms are accomplished a good beginning will have been made at equipping street cars with all the comforts of the auto.

—Omaha World-Herald.

Haven, will operate a line from Waterbury to Hartford which will furnish the transportation for the other part of the Waterbury-Milldale line.

Bus Service in Iowa Planned

The Iowa Railway & Light Company has filed a petition in the Marion County District Court, Cedar Rapids, Iowa, asking for authority to abandon its interurban line connecting Cedar Rapids, Mount Vernon and Lisbon. The company, which has operated bus lines in part-time service over the routes, will establish complete bus service later.

Increased use of automobiles, especially since the paving was laid, was credited with the slump in business on that line, necessitating its disuse. The interurban line was built in 1912. Corporation officials say that at no time did it yield a profit.

Petitions for Kansas City, Kan., Bus Line

A petition for a bus line to connect the Rosedale and Argentine districts of Kansas City, Kan., was filed Oct. 4 with the City Commissioners by the Castle Hill Improvement Association. The commissioners will refer the petition to the Kansas City Public Service Company. Street car patrons at present must go through Kansas City, Mo., to travel between the two districts.

Boston Shoppers Ride Free

A free bus service for shoppers in Boston, Mass., has been arranged by the retail trade board of the Boston Chamber of Commerce with the Motor Mart in Park Square and the Bowdoin Square garage, which are on opposite sides of the shopping district. A ten-minute schedule will be maintained from 8 a.m. until 6 p.m. between these garages and about twenty co-operating stores, which are the leading stores in the city. It is expected that this will induce people coming into the city in their own automobiles to park them at the garages for the day or for the visit and ride to their destination in the free buses, thus relieving street congestion. Many prominent mercantile houses are sponsoring the service.

Hearing on Westchester Fare

A hearing on the Westchester Street Transportation Company's petition to increase from 10 to 20 cents its fare from White Plains to Tarrytown, N. Y., was heard on Oct. 19 by acting Public Service Commissioner H. M. Chamberlain in the offices of the Public Service Commission, New York, N. Y. Officials of the petitioning company and the Third Avenue Railway, which recently purchased the Westchester Street Transportation Company for \$70,000, attended. The fare increase is sought on the ground that the company is losing money.

Financial and Corporate

Kaw Valley Reorganized

Interest charges cut from \$82,470 a year to \$30,000 under plan promising for the future

THE Kansas City, Kaw Valley & Western Railroad has been incorporated in Kansas to take over the properties of the Kansas City, Kaw Valley & Western Railway in accordance with the reorganization plan submitted by the protective committee for the holders of the first mortgage 6 per cent ten-year gold bonds of the old company, sold at foreclosure Sept. 12 and purchased for \$300,000 by the bondholders' protective committee. The new company is capitalized as follows:

First mortgage 4 per cent twenty-year bonds, authorized.....	\$1,000,000
Non-cumulative 6 per cent preferred stock (par \$25) authorized.....	250,000
Common stock without par value, shares..	12,000

The first mortgage bonds are to be dated Oct. 1, 1927, bear coupons payable semi-annually at the rate of 4 per cent per annum and be in the denomination of \$25, \$75 and \$1,000. Bonds shall be secured by a first mortgage upon properties of the company. In order to provide the company with funds for capital improvements without resorting to an assessment against depositing bondholders, the first coupon on the bonds due April 1, 1928, will be detached and surrendered to the company for cancellation.

The preferred stock is to be issued in shares having a par value of \$25, be entitled to non-cumulative dividends at the rate of 6 per cent per annum, be preferred as to assets to the extent of \$25 per share and be subject to redemption by the company, at its option, at par. Each share of preferred stock is to carry the same voting rights as each share of the common stock.

There are to be 12,000 shares of authorized common stock without nominal or par value.

Upon surrender of certificates of deposit, the holder will be entitled to receive first mortgage bonds in principal amount equal to 75 per cent of the principal amount of Kansas City, Kaw Valley & Western Railway first mortgage bonds deposited by him, and preferred stock having a par value equivalent to 25 per cent of such principal amount, together with voting trust certificates for one share of common stock

for each \$100 of the bonds deposited by him. The common stock is to be held for a period of three years by voting trustees to be originally selected by the committee under an agreement approved by the committee.

Of the new first mortgage bonds not needed for this exchange, \$150,000 in principal amount is to be delivered into the treasury of the company, to be used for general corporate purposes and the balance of the authorized first mortgage bonds is to be subject to issuance only upon conditions to be provided in the mortgage.

A small number of shares of preferred stock not needed for exchange will remain as authorized unissued stock. About 30 per cent of the authorized common stock will not be needed for the exchange and this stock will be held in the treasury of the company and all or part of it set aside to be used by the directors for the purpose of procuring a successful operating management, the committee being convinced that it will be to the interest of the new company to have the management financially interested in the prosperity of the company.

The outstanding capitalization of the new company, upon completion of the plan, would then be substantially as follows:

First mortgage bonds.....	(a) \$784,500
Preferred stock.....	211,500
Common stock, shares.....	(b) 12,000

(a) \$150,000 will remain in the treasury of the company. (b) 3,540 shares to be available for management.

The petition for the foreclosure of the mortgage securing the first mortgage bonds was filed with the court on July 15, 1924, but due to the pendency of the litigation was not acted upon by the court until June 15, 1927, at which time the petition was granted and an order of foreclosure and sale was entered, the sale being later set for Sept. 12, 1927. Just previous to the filing of the petition the company informed some of the bondholders early in July, 1924, that it would not be in a position to make payment of the first mortgage bonds which were to mature Aug. 1, 1924. At the time of the formation of the committee, members understood that \$846,000 of these bonds were outstanding, but upon investigation discovered that \$224,000 additional bonds had recently been taken from the treasury of the company and

that its books showed the amount of bonds outstanding to be \$1,070,000. In the meantime, the U. S. District Court for the District of Kansas had appointed Harry C. Jobes receiver, and at the request of the committee the receiver brought an action to cause the bonds taken from the company's treasury to be returned. The case, having been decided in favor of the receiver, was appealed to the U. S. Circuit Court of Appeals, where the trial court was sustained and later a petition for rehearing in the Circuit Court of Appeals was denied.

The committee has kept in touch with the operations of the receiver and believes that the property has been ably managed under him by W. R. Taylor and his associates. The operating statement is shown in the table below.

While the passenger business has been decreasing, there is an encouraging tendency for the freight business to increase. The receiver has continued policies begun by the company in 1916 to build up the freight business and has made considerable expenditures to this end. The company interchanges more than 11,000 carloads of freight a year with several large railroads and the management believes that additional freight business can be obtained. The prospect for an increase in the passenger business, however, is not encouraging the increase in this department in 1926 over 1925 being due to special road conditions which are not likely to recur. The opinion of the management and of the committee was that any reorganization of the company should not involve fixed capital charges in excess of \$30,000 per annum. After thorough analysis of the figures, and after making allowance for the additional costs of the receiver and certain unusual maintenance charges the committee was of the opinion that the company could pay fixed charges of that amount.

It will thus be seen that interest charges on this 41-mile road have been reduced under the reorganization from \$82,470 a year to \$30,000 a year under terms that have taken into account only the holders of the first mortgage bonds.

Private Company Would Take Over Municipal Properties

A struggle over the issue of municipal ownership of public utilities impends in Seattle. It will be ushered in in the form of a drive by the Puget Sound Power & Light Company to force the city of Seattle out of both the light and power and the railway business, it is stated. A. W. Leonard, president of the power company, has declined to disclose details of plan, but letters to Western Washington residents who have recently purchased shares in his concern say:

We have never made a political appeal to our stockholders, but we shall, of course when the time comes—and some of them will come to the front for us.

The plan was brought to a head when Mr. Leonard made an offer to the city

OPERATING STATEMENT KANSAS CITY, KAW VALLEY & WESTERN RAILWAY

	Six Months Ended June 30, 1927	1926	Calendar Years— 1925	1924
Total operating revenue.....	\$208,623	\$460,926	\$366,845	\$375,528
Operating expenses.....	134,735	299,408	261,046	234,591
Maintenance of way, structures and equipment.....	53,134	102,732	89,326	82,458
Taxes.....	6,000	12,054	6,800	19,698
Net revenues.....	\$14,754	\$46,732	\$9,673	\$38,781
Other income—less other deductions.....	1,666	458	761	10,292
a Net available for interest and depreciation.....	\$16,420	\$47,190	\$10,434	\$49,073

furnish power for lighting city streets at a rate considerably lower than that now charged by the municipal light department. The City Council refused to entertain the offer, and Mr. Leonard demanded that it be reconsidered, declaring that the light department is going into debt at a rate so alarming that within five years its payments on outstanding bonds will exceed the amount of its gross revenues. Mr. Leonard says:

The solution is for the city to lease its power and light and its railway properties to a private company, like ours, at a rental based upon fair valuations. Because we would not be required to pay taxes on these properties and through economies resulting from the elimination of duplications—we would not have to increase our overhead at all—we would be able to make a substantial reduction in rates here under such an arrangement.

Bankruptcy Petition in Hannibal

The Hannibal Railway & Electric Company, Hannibal, Mo., filed a petition in bankruptcy in the United States court in that city on Oct. 10 and Frank C. Hodgdon, local banker and president of the company, was appointed receiver. A schedule of liabilities was filed but an officer of the company estimated that the company owed \$200,000.

Control of the company was purchased last winter by owners of the Hannibal Transportation Company, operating buses in and out of Hannibal. It was stated that the bankruptcy proceedings were taken to dispose of the indebtedness taken over with that deal. As a

result of settlement of a suit for paying bills and for power the company owes the city more than \$16,000.

Wisconsin Taxes Total \$3,945,497

Electric railways operating in Wisconsin will pay taxes of \$3,945,497 on the basis of assessed valuation of \$209,155,000, according to figures revealed by the Wisconsin Tax Commission. The tax rate was slightly higher this year than last year.

A. E. Fitkin & Company Retire from Utility Field

A. E. Fitkin, who recently bought the Stock Exchange membership of Walter L. Ross for \$240,000, will hereafter conduct the firm of A. E. Fitkin & Company, New York, N. Y., as a general investment and Stock Exchange house. This announcement was made on Oct. 17 by A. E. Fitkin, who made known his own retirement from the public utility field and the sale of the Inland Power & Light Corporation for \$30,000,000 to Samuel Insull & Sons, Inc. Only a few miles of railway line in Arkansas are included in the Inland Power & Light Corporation.

Mr. Fitkin will leave for Europe on Oct. 26, where he will establish foreign connection for his firm. He entered the public utility field fifteen years ago. Since that time he has acquired properties all over the country. He has been disposing of them for the past year.

35,000 Shares of Pennsylvania-Ohio Stock Offered

The Pennsylvania-Ohio Power & Light Company, Youngstown, Ohio, through a syndicate including Bonbright & Company and Eastman, Dillon & Company, is offering at \$99 per share and accrued dividend, to yield about 6.05 per cent, 35,000 shares of its \$6 cumulative preferred stock. The proceeds from the sale of this issue of preferred stock will reimburse the company for expenditures for additions and improvements to its properties and provide funds for other additions and improvements already contracted for. The Pennsylvania Power & Light Company controls the Shenango Valley Traction Company.

Byllesby Buys Wisconsin Property

Acquisition of the Wisconsin Valley Electric Company, Wausau, Wis., by the Standard Gas & Electric Company was announced on Oct. 18 by H. M. Byllesby & Company. Nine miles of railway line is included in the deal.

Boston & Worcester Sale Approved

Approval of the reorganization of the Boston & Worcester Street Railway under a new name and new capital was asked in a petition presented in Boston on Oct. 18 to the State Department of Public Utilities by Henry B. Rising of Newton, Mass. Mr. Rising and fifteen associates bought the railway following a Supreme Court decree of foreclosure issued on behalf of Middlesex County. The court confirmed the sale. The new company would be known as the Boston, Worcester & New York Street Railway Company, with a total capital stock of \$2,152,000. The sale was mentioned in the ELECTRIC RAILWAY JOURNAL, issue of Oct. 15, page 758.

Conspectus of Indexes for October, 1927

Compiled for Publication in This Paper by
ALBERT S. RICHEY
Electric Railway Engineer, Worcester, Mass.

	Latest	Month Ago	Year Ago	Since War	
				High	Low
Street Railway Fares* 1913 = 4.84	Oct. 1927 7.54	Sept. 1927 7.53	Oct. 1926 7.40	Oct. 1927 7.54	May 1923 6.88
Electric Railway Materials* 1913 = 100	Oct. 1927 142.1	Sept. 1927 141.6	Oct. 1926 155.4	Sept. 1920 247.5	Sept. 1927 141.6
Electric Railway Wages* 1913 = 100	Oct. 1927 228.2	Sept. 1927 228.0	Oct. 1926 226.2	Sept. 1920 232	March 1922 206.8
Am. Elec. Ry. Assn. Construction Cost Elec. Ry.) 1913 = 100	Oct. 1927 199.2	Sept. 1927 199.4	Oct. 1926 202.9	Oct. 1920 256.4	May 1922 167.4
Eng. News-Record Construction Cost General 1913 = 100	Oct. 1927 204.4	Sept. 1927 203.6	Oct. 1926 209.8	June 1920 273.8	March 1922 162.0
U. S. Bur. Lab. Stat. Wholesale Commodities 1913 = 100	Sept. 1927 145.7	Aug. 1927 146.6	Sept. 1926 150.5	May 1920 246.7	Jan. 1922 138.3
Radstreet Wholesale Commodities 1913 = 9.21	Oct. 1 1927 13.26	Sept. 1 1927 12.90	Oct. 1 1926 12.79	Oct. 1 1920 20.87	June 1 1921 10.62
U. S. Bur. Lab. Stat. Retail Food 1913 = 100	Sept. 1927 154.0	Aug. 1927 152.4	Sept. 1926 158.5	Sept. 1920 219.2	March 1922 138.7
Nat. Ind. Conf. Bd. Cost of Living 1914 = 100	Sept. 1927 162.8	Aug. 1927 162.0	Sept. 1926 166.8	July 1920 204.5	Aug. 1922 154.5
Steel Unfilled Orders (Million Tons) 1913 = 5.91	Sept. 30 1927 3.148	Aug. 31 1927 3.196	Sept. 30 1926 3.594	July 31 1920 11.118	May 31 1927 3.651
Bank Clearings Outside N. Y. City (Billions)	Sept. 1927 18.62	Aug. 1927 17.92	Sept. 1926 18.12	Oct. 1925 20.47	Feb. 1921 10.43
Business Failures Number	Sept. 1927 1416	Aug. 1927 1448	Sept. 1926 1250	Jan. 1924 2231	Aug. 1925 1353
Liabilities (Millions)	Sept. 1927 40.08	Aug. 1927 44.37	Sept. 1926 35.29	Jan. 1924 122.95	Aug. 1925 27.22

*The three index numbers marked with an asterisk are computed by Mr. Richey, as follows: Fares index is average street railway fare in all United States cities with a population of 50,000 or over except New York City, and weighted according to population. Street Railway Materials index is relative average price of materials (including fuel) used in street railway operation and maintenance, weighted according to average use of such materials. Wages index is relative average maximum hourly wage of motormen, conductors and operators on 136 of the largest street and interurban railways operated in the United States, weighted according to the number of such men employed on these roads.

Piece of New Jersey Property Sold

The New Jersey Board of Public Utility Commissioners has granted permission to the Public Service Railway, Newark, N. J., to sell a parcel of land at Bonhamtown for \$9,000. The property has been purchased by a church.

Increase in Capital Stock in Bristol

The Bristol Traction Company, Bristol, Conn., has filed notice of an increase in capital stock from \$50,000 to \$750,000. To provide for the increase the company has issued 7,000 additional shares of a certain class of stock with a par value of \$100. Stockholders recently voted in favor of the increase. The company was only recently incorporated and previously was operated as a part of the Bristol Electric Light & Power Company.

Personal Items

F. W. Doolittle Heads East St. Louis Properties

No more logical successor to the post vacated by W. H. Sawyer as president of the East St. Louis & Suburban Railway and its affiliated properties in East St. Louis, Ill., could be found than F. W. Doolittle, vice-president of the North American Company, New York, N. Y., controlling company. Mr. Doolittle's appointment was recently made following the resignation of Mr. Sawyer to assume the presidency of Stevens & Wood. Mention of the latter change was made in *ELECTRIC RAILWAY JOURNAL*, issue of Oct. 15, pages 762 and 763.



F. W. Doolittle

For several years Mr. Doolittle was intimately identified with the activities of the North American Company and its subsidiaries as a special rate and valuation engineer with headquarters at Milwaukee, Wis. Early in 1923 Mr. Doolittle was made vice-president of the North American Company along with J. F. Fogarty. He had been retained by the North American Company since 1916 as consulting engineer and had handled investigations of its new properties and rates and valuation cases for its subsidiaries before various commissions. Prior to that he had been director of the Bureau of Fare Research of the American Electric Railway Association and had won no little attention for the publication of his book on electric railway rates and service known as "Studies in the Cost of Urban Transportation Service."

Mr. Doolittle was born in Hopkinton, Iowa, in 1883. He was graduated from Princeton University and the University of Colorado. He taught engineering at the University of Colorado and the University of Wisconsin and assisted in the development of the statistical department of the Wisconsin Railroad Commission. From there he went to Springfield, Ill., where he did similar organization work for the first Illinois Public Utilities Commission.

The system over which Mr. Doolittle becomes president covers 126 miles of

line serving an estimated population of 131,000. The controlled companies operate the electric railway system of East St. Louis, the only electric line over the Eads Bridge connecting East St. Louis with St. Louis, and interurban lines from East St. Louis to Belleville, Edwardsville and Lebanon.

Control of the operations of the East St. Louis railway properties will be lodged in George W. Welsh and Thomas W. Gregory, resident vice-presidents. The changes are effective Nov. 1.

N. M. Garland to Retire from Active Service

N. M. Garland, affiliated with the Ohio Brass Company, in the New York office, since 1902, will retire on Jan. 1, 1928. He will remain a director of the company, with headquarters in New York, acting in a consulting capacity.

The electrical career of Mr. Garland began in 1892, when he took over the Eastern agency of the Emerson Electric Manufacturing Company. Five years later he became general agent for the Manhattan Electric Light Company and he continued with this utility for a time after it was merged with others to form the New York Edison Company. In 1902 Mr. Garland became Eastern representative of the Ohio Brass Company and since that time he has made a host of friends for the company, has been instrumental in that company's success and has set valuable standards for salesmanship in general. He had the good fortune to become connected with the electrical industry in its earliest days and has made a genuine contribution to its upbuilding.

Mr. Garland is a member of many organizations, among them the New



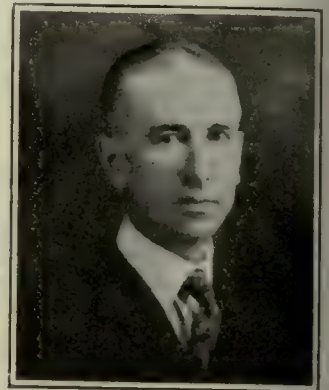
N. M. Garland

York Railroad Club, Engineers' Club, New York Electrical Society and New York Welding Society. His retirement is deeply regretted, but his friends and business associates are rejoicing with him in his ability to follow congenial pursuits.

Otto H. Jorgensen, Car Expert, with Cummings Car & Coach

A well-known car builder and designer has become affiliated with the Cummings Car & Coach Company at its shops in Paris, Ill. Otto H. Jorgensen, with the title of engineer, rail car department, will have a part in all new design, development and construction for the company. Car expert is what Mr. Jorgensen really is, judging him in the light of his experiences and accomplishments.

Mr. Jorgensen is best known in the industry as chief draftsman and acting



O. H. Jorgensen

engineer of equipment of the Chicago Surface Lines, where he worked under H. H. Adams, superintendent of shops and equipment from 1921 to 1926. He left Chicago to accept a position with the Pullman Car & Manufacturing Company as assistant engineer and was engaged in that work at the time of his recent appointment.

It was in Copenhagen, Denmark, that Mr. Jorgensen received his education and was graduated as an electrical engineer. His first work in this country was as draftsman in the railway department of the General Electric Company, Schenectady, N. Y. This was at the time the first New York Central locomotive was being designed and built. Since that time he has been car-conscious and car-concentrating, devoting all his time and expending much energy on the designing and building of cars of various types, ranging from mine cars, through all types of freight cars, passenger cars and street cars to Pullmans. Covering this intensive period he gave his services to some of the principal car companies in the country, among them being the Standard Steel Car Company, Koppel Car & Equipment Company, now owned by the Pressed Steel Car Company, and the Pullman Car & Manufacturing Company.

During the war Mr. Jorgensen served as First Lieutenant, Q.M.C., and was with the American Expeditionary Forces one year in France and Germany, most of that time with the first division motor supply train. He now holds a commission as Captain in the Reserves.

G. J. Baker Has Served Industry a Quarter Century

George J. Baker, whose appointment as general manager of the Buffalo & Erie Railway, Fredonia, N. Y., was announced in the *ELECTRIC RAILWAY JOURNAL*, issue of Oct. 8, 1927, page 721, is well known in traction circles in New York State, where he has had considerable experience.

Twenty-five years ago Mr. Baker entered the employ of the Hamburg Railway at Buffalo as a conductor. Five years later he was promoted to inspector. At this time he took an electric railway correspondence course and made



G. J. Baker

a special study of train rules, train dispatching and time-table making, under R. H. Douglas, then general superintendent of the Buffalo & Lake Erie Traction Company. The latter company had taken over the Hamburg Railway and had started to build the interurban line between Buffalo, N. Y. and Erie, Pa. Operation was begun in 1908, supervised by three different divisions, of which Mr. Baker was in charge of the Eastern Division, Buffalo to Dunkirk.

His first big promotion came on July 1, 1911, when he was promoted to general superintendent of the interurban lines, in charge of all three divisions. Then success virtually followed him. In May, 1913, he was promoted to general superintendent of transportation of the Buffalo & Lake Erie Traction Company, which was then operating in the city of Erie, the Buffalo & Lackawanna Traction Company, the Hamburg Railway and the interurban lines between Buffalo and Erie. In 1917 Mr. Baker was advanced to assistant general manager under A. R. Myers of Erie, Pa., who was then general manager of the Buffalo & Lake Erie Traction Company. He continued in this position until 1924, when the line between Buffalo and Erie was taken over by the Chandler management under George MacLeod as vice-president and general manager. Mr. MacLeod appointed him superintendent and acting general manager during his absence from the property.

Mr. Baker was born in Towanda, Pa., on Aug. 15, 1876. He attended the schools of that village and at the age of

eighteen moved to Philadelphia, where he took up tool making and variety lathe turning. He pursued this work until 1902, when he entered the transportation field.

W. W. Wheatly with Investment Bankers

W. W. Wheatly has joined the banking house of George M. Forman & Company, Inc., with offices at 120 Broadway, New York, to assist in the program of that company for widening the scope of its activities in the railway and public utility investment fields. In the past this old-established house, with main office in Chicago and branches in New York and many other cities, has devoted much attention to real estate first mortgage serial and sinking fund bonds, but more recently has been catering to domestic and foreign securities, purchasing whole issues of government, municipal, railroad, utility and industrial securities for distribution at wholesale and retail. It has also been a participant in national underwritings.

Mr. Wheatly is well known in the railway field. He was long connected with the old Brooklyn Rapid Transit Company and subsequently served with the Public Service Railway of New Jersey, the Mexico Electric Tramways in Mexico City and the Metropolitan Street Railway in Kansas City, Mo., now the Kansas City Public Service Corporation. In each of these cities his work gained substantial recognition, particularly in the trying situation incident to the management of the railways in Mexico's capital. There he represented the English investment firm of Werhner, Beit & Company, by which he was intrusted with the entire details of the management of that property. He represented the Marconi Wireless Telegraph Company in its dealings with the Mexican Government.

Mr. Wheatly's experience, wide and notable as it is, should strengthen materially the organization of Forman & Company in connection with their plan to enter more extensively into the financing of railways, bus lines and other public utilities. This they intend to do, particularly through their New York office.

John A. Miller, Jr., Honored

On the recommendation of a special committee the board of direction of the American Society of Civil Engineers has awarded the Arthur M. Wellington Prize to John A. Miller, Jr., associate editor *ELECTRIC RAILWAY JOURNAL*, for his paper on "Increasing the Efficiency of Passenger Transportation in City Streets." This paper was presented at a meeting of the society held in New York City June 2, 1926. An advance abstract was published in the *JOURNAL* May 8, 1926. The Wellington Prize is awarded annually by the American Society of Civil Engineers for the best paper presented during the previous year on the subject of transportation by land, water or air.

C. N. Chubb Goes to Lincoln

In addition to his appointment as president of the newly formed company known as the Iowa-Nebraska Light & Power Company C. N. Chubb has been appointed president of the Lincoln Traction Company, which supplies transportation service to Lincoln, Havelock and College View as well as the immediate surrounding territory in Nebraska. For the past three years Mr. Chubb's work has covered a wide field as vice-president of the United Light & Power Engineering & Construction Company and as managing supervisor of United Light properties in Iowa,



C. N. Chubb

Nebraska and several other states.

Mr. Chubb has been a prominent figure in utility affairs for many years. In fact, it is said that during his school days he decided that some phase of the utility business should become his life work. Toward this end he studied civil engineering, specializing in steam railway construction, in the Massachusetts Institute of Technology and graduated with the class of 1901. After working for a short time in the steam railway business he saw greater opportunities in gas and electric utilities and joined the Harrisburg Gas Company of Harrisburg, Pa., a subsidiary of the United Gas Improvement Company. Here he served his apprenticeship and for fifteen years continued in the service of properties operated by the United Gas Improvement Company. In addition to his work at Harrisburg he followed gas engineering and superintendence of gas plants at Kansas City, Mo., Sioux Falls, S. D., and South Bend, Ind.

In 1925 Mr. Chubb became vice-president of the United Light & Railways Company and supervisor of the Iowa-Nebraska properties of the United Light.

Mr. Chubb will move his home to Lincoln from Davenport about Nov. 1 with the intention of giving the supervision and management of these properties his entire time and undivided attention.

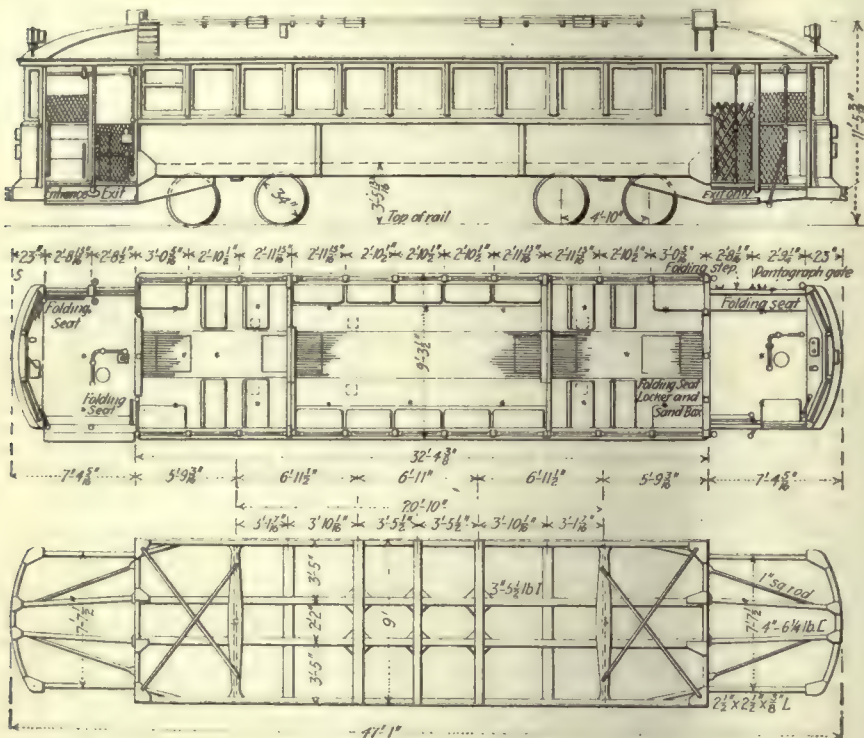
F. KRUG was recently appointed general manager of the Porto Rico Railway, Light & Power Company, San Juan, P. R. He has been serving as acting general manager.

Manufactures and the Markets

Specifications for Ten New Units for Municipal Railway

Subjoined are specifications, seating plan, and general dimensions of the ten two-man city type cars ordered recently by the Municipal Railway of San Fran-

cisco, mention of which was made in the JOURNAL for July 23. These cars are being built by the St. Louis Car Company from specification used in the construction of the fifteen units delivered by the St. Louis company in May. The units will have a seating capacity of



Framework and seating plan, also elevation, of Municipal Railway's new units



Typical interior view of two-man cars recently ordered by the Municipal Railway of San Francisco from the St. Louis Car Company

fifty passengers each and are to be of semi-steel construction, similar to the 145 units that were built by the company last year.

Spanish Railroads to Electrify

The Oerlikon Company has recently received a contract for the complete electrical equipment of all the substations of a Spanish railroad, the Ferrocarriles Vascongados, connecting San Sebastian with Bilbao, on which high-tension direct current is being adopted as the traction system. The substations are fed with three-phase current of 29,000 volts, 50 cycles, which is converted into direct current by means of a rotary converter equipment. The converters are notable, as regards both capacity and pressure. They are being designed for a continuous output of 1,200 kw. and for a terminal pressure of 1,750 volts on the d.c. side.



Exterior appearance and specifications of new 50-passenger, semi-steel units for Municipal Railway of San Francisco, ten of which were ordered recently. These are similar to the fifteen units delivered in May

Number of units	10	Axes	E-6 forged steel	Journal boxes	4x8 in. No. 8801
Type of unit	Two-man, motor, passenger, city, double end, double truck	Car signal system	Faraday high voltage	Lamp fixtures	Safety Car Heating & Lighting Co.
Number of seats	50	Compressors	Westinghouse DH-16	Motors	Four Westinghouse 306-CA, outside hung
Builder of car body	St. Louis Car Company, St. Louis, Mo.	Conduit	Pipe conduit	Painting scheme	Gray—gold stripe, cherry cash
Weight, total	50,000 lb.	Control	Westinghouse HL	Roof material	National standard FF roofing canvas
Bolster centers	20 ft. 10 in.	Couplers	Anti-climber	Seats	Hale & Kilburn 400-A
Length over all	47 ft. 1 in.	Destination signs	Hunter	Seat spacing	30 in.
Length over body posts	32 ft. 4 in.	Door mechanism	National Pneumatic	Seating material	Slat and plywood
Truck wheelbase	4 ft. 10 in.	Doors	Sliding	Slack adjusters	American, type J
Width over all	9 ft. 2 in.	Fare boxes	Johnson	Steps	Folding
Height, rail to trolley base	11 ft. 8 in.	Finish	Paint	Step treads	Kass
Window post spacing	2 ft. 11 in.	Floor covering	Industrial carpet on platforms	Trolley catchers	Ohio Brass
Body	Semi-steel	Gears and pinions	Nuttall helical	Trolley base	Nuttall 20-A
Roof	Arch	Hand brakes	Peacock, Dayton handle	Trolley wheels	Kalamazoo
Doors	End	Headlights	Golden Glow SR-95	Trucks	Brill 27-E
Air brakes	Westinghouse SME-D1	Headlining	Haskelite, three-ply	Ventilators	Garland exhaust
Armature bearings	Babbitt	Interior trim	Birch-stained cherry	Wheels	Roller steel, 34 in. diameter
		Journal bearings	Plain	Wheelguards	Eclipse



Built with uniform lines and attractively painted, the Rockford & Interurban Railway units present a striking appearance

Rockford Receives Seven New Interurban Cars

The Rockford & Interurban Railway, Rockford, Ill., has accepted delivery on seven new cars ordered on March 2 from the American Car Company of St. Louis.

As mentioned in the JOURNAL of July 30, these cars are of the combination passenger, smoker and baggage car type. The new cars embody the latest in interurban car design and have several new features. Built with low and uniform lines and attractively painted, the cars present a striking appearance. The rear end is of the observation type with a wide center window and awning, as shown in the illustration below.

No ceiling lighting fixtures are present, the indirect lighting system being used. Seats are of the semi-individual type, upholstered in leather. An interesting feature is that each car is equipped with different color seats and interior trim. Consistent with the uniform lines throughout is the one-level floor from end to end.

The cars, which have a seating capacity of 52, are of semi-steel construction and designed for a speed of 60 m.p.h.

Details of the cars are repeated here:

Number of cars ordered.....	Seven
Builder of car body.....	American Car Company
Type.....	Combination passenger, smoker, baggage
Seating capacity.....	52
Weight, total.....	35,750 lb.
Bolster centers, length.....	25 ft. 6 in.
Length over all.....	45 ft. 6 in.
Truck wheelbase.....	5 ft. 4 in.
Width over all.....	8 ft. 8 in.
Height, rail to trolley base.....	10 ft. 8 in.
Body.....	Semi-steel
Interior trim.....	Agasote
Headlining.....	Agasote
Roof.....	Arch
Air brakes.....	General Electric, straight
Armature bearings.....	Ball
Bumpers.....	Channel
Car signal system.....	Faraday
Car trimmings.....	Bronze, oxidized
Compressors.....	CP-72
Control.....	K-75
Couplers.....	American Car Company
Curtain fixtures.....	Curtain Supply Company
Curtain material.....	Pantasote
Destination signs.....	Hunter
Door-operating mechanism.....	National Pneumatic
Gears and pinions.....	General Electric
Hand brakes.....	Brill vertical
Heater equipment.....	Railway Utility
Headlights.....	Crouse-Hinds
Journal bearings.....	Ball
Journal boxes.....	J. G. Brill Company
Lightning arresters.....	Aluminum
Motors.....	Four GE-247, inside hung
Sanders.....	Nichols-Lintern Company, No. 4
Sash fixtures.....	Schechter post casing
Seats.....	American Wicker Works
Seating material.....	Leather
Springs.....	J. G. Brill Company
Step treads.....	Kass safety
Trolley catchers.....	Ohio Brass Company
Trolley base.....	U.S. 20
Trolley wheels.....	U.S.
Trucks.....	Brill 177-E-1
Wheels.....	26-in. rolled steel

Pullman Gets Order for Fifteen North Shore Line Cars

Orders for fifteen new high-speed interurban motor cars for the Chicago, North Shore & Milwaukee Railroad were received Oct. 1 by the Pullman Car & Manufacturing Corporation, Chicago. Each car will be equipped with individual bucket type easy chairs for 52 passengers and will contain a commodious smoking compartment and two lavatories.

N.E.M.A. to Discuss Market Development at October Meeting

Market development will be the keynote of the Briarcliff, N. Y., meeting of the apparatus division, National Electrical Manufacturers Association, during the week of Oct. 24, according to a statement by J. M. Curtin, vice-president in charge of this division. Morning sessions will be devoted to section meetings and business. There will be a banquet Thursday evening and a meeting of the board of governors in New York City on Tuesday evening. On Thursday morning a meeting of the board will be held in conjunction with



At left, view showing the observation type rear end with wide center window of Rockford cars. At right, interior view showing the one-level floor and the deep-cushioned individual type seats. Note the absence of dome ceiling lights

all officers of the sections and divisions. The above outlines the program planned in connection with the gathering.

Trackwork of International Railway Making Rapid Strides

The International Railway's \$250,000 track and paving reconstruction program in Buffalo, N. Y., is making rapid strides toward completion, according to President B. J. Yungbluth. Work was begun on Fillmore and North Parade on Aug. 8, and since that time a force of 150 men have been working steadily laying more than 2 miles of track and concrete, at the average of 267 ft. per day. The company is also laying new tracks and paving on Fillmore Avenue from North Parade to East Ferry Streets. Work on the northbound track has been completed, including concreting. The asphalt surfacing will be finished during the next few days. The stretch from North Parade to Ferry Street on the southbound track has also been completed, the only remaining work being the surfacing of the track from Utica to Ferry Street. Special trackwork being installed at Utica and Ferry Streets is practically finished. It is estimated that with favorable weather conditions the surfacing should be finished and all other work completed on Fillmore in a short time.

On Seneca Street, where work was begun Aug. 15, the eastbound track and paving has been completed from Buffalo River to Graymont Street, except for the stretch between Seneca-Parkside and Cazenovia, where the new track and concrete paving have been laid. On the westbound side of the street, where work was started Sept. 26, new track from Buffalo River to Stevenson has been installed. The excavating machines are rapidly closing the gap on the westbound track from Duerstein to Stevenson, where rails and concrete work are being pushed to completion.

Copper Sales Largest in Eight Months

Extremely heavy copper sales last Thursday, Friday and Saturday at 13½ cents in the East and 13¾ cents in the Middle West, following many weeks of dullness, were the feature of the metal market for the week ended Oct. 19. A large tonnage of lead has also been booked, particularly in the Middle West, where prices have advanced.

After having resolutely held out for 13½ cents for many weeks without getting much business at that level, copper sellers without exception found buyers willing to pay that price last Thursday. An extremely heavy tonnage was sold on that day and the two succeeding days, partly at 13½ cents delivered in the East, and some at 13¾ cents in the Middle West. The last three days have been much quieter, but the total business for the week has been the largest since that for the week of Feb. 9.

METAL, COAL AND MATERIAL PRICES F. O. B. REFINERY

Metals—New York		Oct. 18, 1927
Copper, electrolytic, cents per lb.	13.025	
Copper wire, cents per lb.	13.25	
Lead, cents per lb.	6.25	
Zinc, cents per lb.	6.00	
Tin, Straits, cents per lb.	58.50	
Bituminous Coal, f.o.b. Mines		
Smokeless mine run, f.o.b. vessel, Hampton Roads, gross tons.	\$4.175	
Somerset mine run, Boston, net tons.	1.80	
Pittsburgh mine run, Pittsburgh, net tons.	1.825	
Franklin, Ill., screenings, Chicago, net tons.	1.575	
Central, Ill., screenings, Chicago, net tons.	1.625	
Kansas screenings, Kansas City, net tons.	2.425	
Materials		
Rubber-covered wire, N. Y., No. 14, per 1,000 ft.	\$5.50	
Weatherproof wire base, N. Y., cents per lb.	16.00	
Cement, Chicago net prices, without bags.	2.05	
Linseed oil (5-bbl. lots), N. Y., cents per lb.	10.6	
White lead in oil (100-lb. keg), N. Y., cents per lb.	13.75	
Turpentine (bbl. lots), N. Y., per gal.	\$0.58	

Oct. 18 and Oct. 19 slight concessions in price were made by certain interests, but the market is generally firm. Second-hands are also offering prompt copper a little below the 13½ cents level.

The zinc market has been as quiet as that of copper has been active. Early in the week prices hardened to 6.10 cents, with slightly higher quotations on occasional lots, but on Oct. 18 and Oct. 19 the metal was offered as low as 6 cents, St. Louis.

Lead sellers have enjoyed an unusually active week, although inquiry on Oct. 19 quieted somewhat. Demand was keener in the Middle West than in the East, and on Friday and Monday good-sized transactions were made at 6.075 cents. In New York the American Smelting & Refining Co. continued its official price at 6.25 cents, and this was the ruling figure for the "outside" market also.

In the New York market prices are firmer, but business is dull. Spot metal commands a ¼ cent premium over late October and ½ cent over December.

ROLLING STOCK

FRESNO TRACTION COMPANY, Fresno, Cal., is reported to be planning the purchase of ten new trolley cars valued at \$150,000.

CHICAGO, AURORA & ELGIN RAILROAD reports receipt of five of the fifteen new de luxe passenger steel coaches, details for which were given in the JOURNAL recently.

WINNIPEG HYDRO-ELECTRIC COMPANY, a municipally owned concern in the Province of Manitoba, Canada, has recently purchased a 20-ton gas-electric locomotive manufactured by the Davenport Locomotive & Manufacturing Company, Davenport, Iowa. The new unit is rated at approximately 160 net horsepower. Gasoline engines are controlled by one hand throttle and the electric motors by a foot accelerator. The cab is equipped with a lighting, heating and ventilating plant. According to advices, two 30-ton models are now in process of construction.

TRADE NOTES

ERIC H. EWERTZ, past-president of the American Welding Society and formerly general manager of the Bethlehem Shipbuilding Corporation, has opened an office at 50 Church Street, New York, N. Y., as a consulting engineer on problems relating to welding, mechanical and economic engineering.

ALEXANDER MILBURN COMPANY, Baltimore, Md., manufacturer of welding and cutting apparatus, has organized an office in Boston to be known as the Alexander Milburn Sales Company, Wiggin Terminals Building, 50 Terminal Street, Boston, Mass. This office is under the supervision of M. B. Crouse and G. B. Malone, both experienced executives in welding and cutting equipment, who will handle the sale and distribution of Milburn equipment throughout New England.

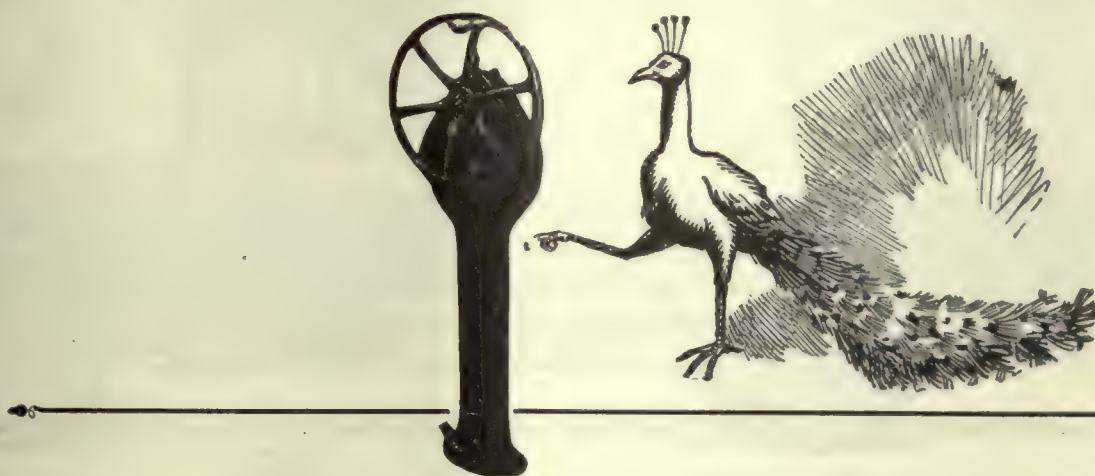
ROLLER-SMITH COMPANY, New York City, announces the appointment of the D. H. Braymer Equipment Company, W.O.W. Building, Omaha, Neb., as its representative for Nebraska and western Iowa. D. H. Braymer is at the head of this organization. The Braymer company will handle Roller-Smith instruments, relays and circuit breakers in the territory specified.

ADVERTISING LITERATURE

PARKER APPLIANCE COMPANY, Cleveland, Ohio, has sent out a booklet on Parker tube couplings for copper tube water and gas services.

LINDE AIR PRODUCTS COMPANY has issued a 72-page booklet consisting of a report of the design, development, fabrication and testing of a series of oxyacetylene welded roof trusses of the Fink type. It includes drawings, illustrations and tables. As far as possible the contents are arranged in chronological order. The booklet is by H. H. Moss of the development section, engineering department of the company.

GENERAL ELECTRIC COMPANY, Schenectady, N. Y., has recently issued the following loose-leaf bulletins: G-E squirrel-cage motors, "500 series"; adjustable varying speed motors, type BSR; air compressor governors; vertical "500 series" induction motors; type BTA motors; CR 1038 motor-starting switches; G-E general purpose synchronous motors, "7500 series"; new form R-totally inclosed induction motor, "500 series"; CR 1923-A1 a.-c. jack type disconnecting switches; G-E air heating units and G-E clamp-on units; improved brush-holders and ventilating covers for GE-275 railway motors; primary cutouts for railway signal high-voltage power lines; switchboard recording instruments; horizontal edge-wise instruments, types H-5, H-6 and DH-5, and CR 2940 push-button stations.



They cannot choke with chain—

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A Peacock Staffless Brake will stop the car under the most extreme conditions of slack. It will wind all the chain there is to wind and do it without clogging. Peacock Staffless Brakes are dependable emergency equipment. They stop the car every time.



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Increased flexibility and quiet, a wide power range and a greater operating economy due to the 4-speed transmission—

Greater safety with 4-wheel brakes (Lockheed hydraulic)—

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Ask your local Dodge Brothers Dealer about these new Graham Brothers Motor Coaches.

\$4045

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21-Passenger Street Car
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16-Passenger Parlor
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DEALERS EVERYWHERE

MOTOR

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Higher Speed

4 **WHEEL BRAKES -**
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3 **STAGE SPRINGS -**
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Refinements throughout in design and construction have resulted in a finer Graham Brothers Motor Coach. Add to this the fact that service, when needed, is available from Dodge Brothers Dealers everywhere and you see why Graham Brothers Motor Coaches are so desirable and practical.

BROTHERS
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"WELD PLATES"

For EFFICIENT, ECONOMICAL
JOINTS

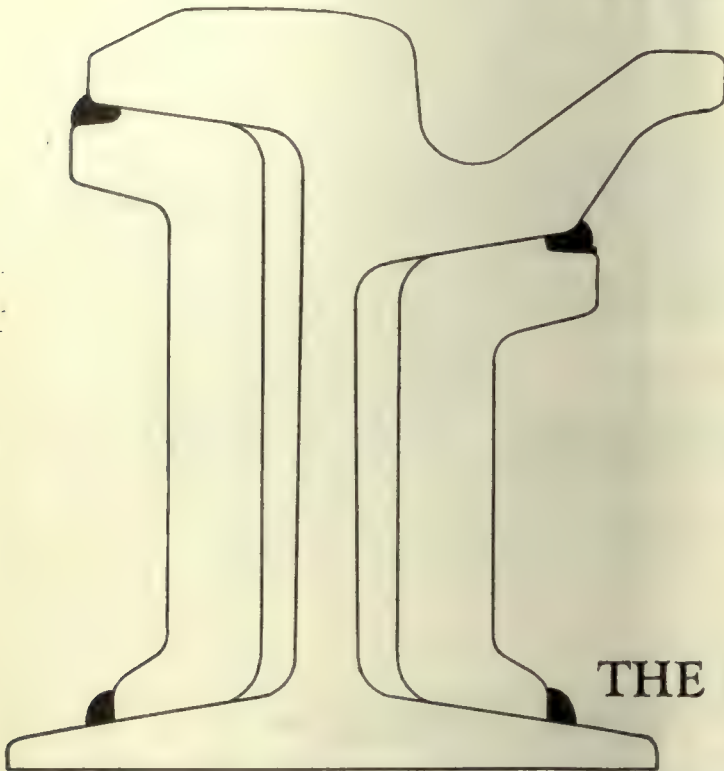
Do you believe in statistics? Rely on performance records? If so the performance records of the many "Weld Plates" now in use will convince you that they lead the bar-weld joints in efficiency and economy.

"Weld Plates" represent the most modern welding practice. They are the strongest and most up-to-date plates rolled especially for electric welded joints. Note the shape—the grooves for retaining plenty of weld metal along the upper edges—the wide contact areas at top and bottom—the suitability for the use of short bolts.

A trial will convince you of their efficiency and economy.

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165 Broadway, New York



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410 North Michigan Ave.
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Griffin Wheels

with
Chilled Rims
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Chilled Back of Flanges
For Street and Interurban
Railways

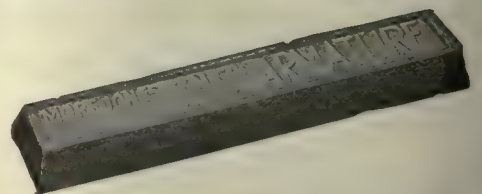
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SIBAYI

Sibayi is the spot in the center of the kraal into which the animals are driven at night to protect them from prowling lions.

Then a guard is provided to protect the sibayi.

Of course, with a proper sibayi in the first place no attendant would be needed. But they must have had their tip from operators of electric machines who used to buy carbon brushes, and then provide a man to slop lubricant on the commutator to help out the brushes.

Perhaps they didn't know that Morganite Brushes would do both the brush job and the man job.

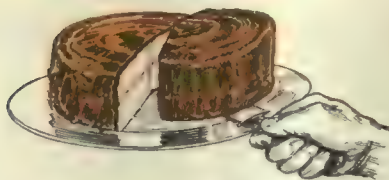
This is to tell them.

Morganite Brush Co., Inc.

Main Office and Factory
3302-3320 Anable Ave., Long Island City, N. Y.

DISTRICT ENGINEERS AND AGENTS

Pittsburgh, Electrical Engineering & Mfg. Co., 909 Penn Ave.
Cincinnati, Electrical Engineering & Mfg. Co., 607 Mercantile Library Building.
Cleveland, Electrical Engineering & Mfg. Co., 422 Union Building
Baltimore, O. T. Hall, Sales Engineer, 437-A Equitable Building.
Revere, Mass., J. F. Drummey, 75 Pleasant Street.
Los Angeles, Electrical Engineering Sales Co., 502 Delta Building.
San Francisco, Electrical Engineering Sales Co., 222 Underwood Building, 545 Market Street.
Toronto, Can., Railway & Power Engineering Corp., Ltd., 101 Eastern Ave.
Montreal, Can., Railway & Power Engineering Corp., Ltd., 326 Craig St., West.
Winnipeg, Can., Railway & Power Engineering Corp., Ltd., P. O. Box 325.



One INDUSTRIAL ADVERTISER *captured 40% of a rich market*

FIVE years ago an important industrial change appeared on the horizon. It meant a new market and new profits. At that time it was anybody's market, a new field for all, with no established leader.

A score of producers saw the opportunity, but one alert manufacturer nominated himself for the post of leadership. During the period when buyers were testing, comparing and experimenting with his and competing products, this manufacturer dominated buyers' thoughts by the forceful use of Industrial Advertising.

By so doing, this manufacturer "beat the gun" in the rush to the new field of profits. In 1926, after four years of Industrial Advertising, 46 per cent of all buyers in this particular field were his customers. His output constituted 40 per cent of all sales to this market last year. Over the four-year period, when competitors were fluctuating up and down in rank, strong Industrial Advertising kept this one manufacturer entrenched in the lead.

Industrial Advertising vs. "Using Space"

His competitors also advertised but this manufacturer continuously used the most effective space units of Industrial Advertising to win this new industry's recognition of his product. His advertising appropriation was large enough each year to carry on the leadership job originally

mapped out. His copy reflected an intimate knowledge of the buyers' problems and talked their language. There was no stinting of effort in obtaining and presenting vital performance facts. Industrial advertising men combed the field for data before the advertising copy was prepared.

This advertising was published almost exclusively in two McGraw-Hill Publications that are recognized for the vital guidance and help they have given to the industry that constituted this manufacturer's market.

In this case the persistent use of liberal space was true economy and extremely effective. It not only hastened the industrial change and gained for the manufacturer that much-desired buyers' recognition, but it is now enabling him to hold the lead and advance to still greater sales volume.

Details Differ, But Not Fundamentals

Your industrial selling problem may differ in detail from the case cited. One set of circumstances demands dominant Industrial Advertising from the start; another situation may recommend a different program. The proper procedure in any case is more easily determined when the McGraw-Hill book, "Industrial Marketing at Work," is studied, and its basic principles applied. This book is based on a study of numerous cases in which the Four Principles of Industrial Marketing have been used.

If your markets lie within any field of industry broader than your strictly local territory, a McGraw-Hill representative will be glad to discuss this study and leave with you or your advertising agent a complimentary copy. Your request should be directed to the nearest McGraw-Hill office.



This advertisement is being published in the McGraw-Hill Publications, Printers Ink Monthly, Advertising and Selling, Class and Industrial Marketing, Finance and Industry, Standard Rate and Data Service, New York Times, New York Herald Tribune, Boston News Bureau and Chicago Journal of Commerce.

McGraw-Hill Publishing Company, Inc., New York, Chicago, Philadelphia, Cleveland, St. Louis, San Francisco, London. Publishers of

McGraw-Hill

Publications

Electrical
ELECTRICAL WEST
ELECTRICAL WORLD
ELECTRICAL MERCHANDISING

Construction & Civil Engineering
ENGINEERING NEWS RECORD
CONSTRUCTION METHODS

Industrial
POWER
AMERICAN MACHINIST
INDUSTRIAL ENGINEERING
CHEMICAL & METALLURGICAL ENGINEERING

Catalogs and Directories

McGraw-Hill Electrical Engineering Catalog
McGraw-Hill Electrical Trade Catalog McGraw Central Station Directory
Keystone Coal-Mining Catalog McGraw Electric Railway Directory
Keystone Metal Quarry Catalog Metal Quarry Directory
Keystone Coal Buyers Catalog Coal Field Directory
Bonbright Survey of Electric Power & Light Companies in the U.S.

Radio
RADIO RETAILING
Transportation
BUS TRANSPORTATION
ELECTRIC RAILWAY JOURNAL

Mining
COAL AGE
COAL AGE NEWS
ENGINEERING & MINING JOURNAL

Overseas
INGENIERIA INTERNACIONAL
AMERICAN MACHINIST
(EUROPEAN EDITION)

Bankers and Engineers

Ford, Bacon & Davis Incorporated Engineers

115 Broadway, New York
PHILADELPHIA CHICAGO SAN FRANCISCO

The J. G. White Engineering Corporation

Engineers—Constructors

Oil Refineries and Pipe Lines, Steam and Water Power Plants, Transmission Systems, Hotels, Apartments, Office and Industrial Buildings, Railroads.

43 Exchange Place

New York

STONE & WEBSTER

Incorporated

Design and Construction
Examinations Reports Appraisals
Industrial and Public Service Properties

NEW YORK BOSTON CHICAGO

THE BEELER ORGANIZATION

Transportation, Traffic, Operating Surveys
Better Service—Financial Reports
Appraisals—Management

52 Vanderbilt Ave.

New York

SANDERSON & PORTER ENGINEERS

PUBLIC UTILITIES & INDUSTRIALS

Design Construction Management
Examinations Reports Valuations

CHICAGO NEW YORK SAN FRANCISCO

ENGELHARDT W. HOLST

Consulting Engineers

Appraisals Reports Rates Service Investigation
Studies on Financial and Physical Rehabilitation
Reorganization Operation Management

683 Atlantic Ave., BOSTON, MASS.

ALBERT S. RICHEY

ELECTRIC RAILWAY ENGINEER

WORCESTER, MASSACHUSETTS

REPORTS - APPRAISALS - RATES - OPERATION - SERVICE

LINN & MARSHALL, Inc.

Financing — Engineering — Management

PUBLIC UTILITIES

ELECTRIC RAILWAYS — MOTOR BUSES —

GAS — ELECTRIC

25 Broadway, New York City

C. B. BUCHANAN President
W. H. PRICE, JR. Sec'y-Treas.
JOHN F. LAYNG Vice-President
BUCHANAN & LAYNG CORPORATION
Engineering and Management, Construction
Financial Reports, Traffic Surveys
and Equipment Maintenance

BALTIMORE
1004 Citizens National
Bank Bldg.

Phone:
Hanover: 2142

NEW YORK
49 Wall Street

DAY & ZIMMERMANN, INC. ENGINEERS

DESIGN - CONSTRUCTION - REPORTS
VALUATIONS - MANAGEMENT

NEW YORK

PHILADELPHIA

CHICAGO

HEMPHILL & WELLS

CONSULTING ENGINEERS

Gardner F. Wells

Albert W. Hemphill

APPRAISALS

INVESTIGATIONS COVERING

Reorganization Management Operation Construction
43 Cedar Street, New York City

STEVENS & WOOD

INCORPORATED

ENGINEERS AND CONSTRUCTORS

120 BROADWAY, NEW YORK

ENGINEERING
CONSTRUCTION

YOUNGSTOWN, O.

FINANCING
MANAGEMENT

KELKER, DELEUW & CO.

CONSULTING ENGINEERS

REPORTS ON

Operating Problems Valuations Traffic Surveys

111 W. Washington Street, Chicago, Ill.

McCLELLAN & JUNKERSFELD

Incorporated

ENGINEERING AND CONSTRUCTION

Examinations—Reports—Valuations

Transportation Problems—Power Developments

68 Trinity Place, New York

Chicago

St. Louis

E. H. FAILE & CO.

Designers of

Garages—Service Buildings—Terminals

441 LEXINGTON AVE.

NEW YORK

WALTER JACKSON

Consultant on Fares and Motor Buses

The Weekly and Sunday Pass—Differential
Fares—Ride Selling

Holbrook Hall 5-W-3

160 Gramatan Ave., Mt. Vernon, N. Y.

THE BABCOCK & WILCOX COMPANY

85 LIBERTY STREET, NEW YORK

Builders since 1868 of
Water Tube Boilers
of continuing reliability

BRANCH OFFICES

BOSTON, 80 Federal Street
PHILADELPHIA, Packard Building
PITTSBURGH, Farmers Deposit Bank Building
CLEVELAND, Guardian Building
CHICAGO, Marquette Building
CINCINNATI, Traction Building
ATLANTA, Candler Building
PHOENIX, ARIZ., Heard Building
DALLAS, TEX., Magnolia Building
HONOLULU, H. T., Castle & Cooke Building
PORTLAND, ORE., Gasco Building



WORKS
Bayonne, N. J.
Barberton, Ohio

Makers of Steam Superheaters
since 1898 and of Chain Grate
Stokers since 1893

BRANCH OFFICES

DETROIT, Ford Building
NEW ORLEANS, 344 Camp Street
HOUSTON, TEXAS, Electric Building
DENVER, 444 Seventeenth Street
SALT LAKE CITY, Kearns Building
SAN FRANCISCO, Sheldon Building
LOS ANGELES, Central Building
SEATTLE, L. C. Smith Building
HAVANA, CUBA, Calle de Agular 104
SAN JUAN, Porto Rico, Royal Bank Building

THE P. EDWARD WISH SERVICE

10 Church St.
NEW YORK

Street Railway Inspection
DETECTIVES

131 State St.
BOSTON

J. ROWLAND BIBBINS

Engineer—2301 Connecticut Ave., N.W., Washington, D. C.

TRANSPORTATION SURVEYS

Organized Traffic Relief and Transit Development
Co-ordinating Motor Transport, Railroad and City
Plans, Service, Routing, Valuation, Economic Studies
EXPERIENCE IN 20 CITIES

When writing the advertiser for information or
prices, a mention of the Electric Railway
Journal would be appreciated.

Hale and Kilburn SEATS

Better Quality Seats
For Cars and Buses

Hale-Kilburn Co.
1500 Lehigh Ave., Philadelphia, Pa.

RAIL GRINDERS AND WELDERS

Railway Track-work Co., Philadelphia

683

Transmission Line and Special Crossing Structures, Catenary Bridges

WRITE FOR OUR NEW DESCRIPTIVE CATALOG

ARCHBOLD-BRADY CO.

Engineers and Contractors

SYRACUSE, N. Y.

UNA

**RAIL JOINTS
DYNAMOTORS
WELDING ROD**

UNA Welding & Bonding Co.
Cleveland, Ohio.



Car Heating and Ventilating

—are no longer operating problems. We can show you
how to take care of both with one equipment. The Peter
Smith Forced Ventilation Hot Air Heater will save, in
addition, 40% to 60% of the cost of any other car heat-
ing and ventilating system. Write for details.

The Peter Smith Heater Company
6209 Hamilton Ave., Detroit, Mich.

Boyerized Parts:

Brake Pins
Brake Hangers
Brake Levers
Pedestal Gibs
Brake Fulcrums
Turnbuckles
Center Bearings
Side Bearings
Spring Post Bushings
Spring Posts
Bolster and Transom
Chafing Plates
Manganese Brake Heads
Manganese Truck Parts
Bushings
Bronze Bearings
McArthur Turnbuckles

Can be purchased through the following
representatives:

Economy Electric Devices Co.,
72 W. Van Buren St., Chicago, Ill.
F. F. Bodier,
903 Monadnock Bldg., San Francisco, Cal.
W. F. McKenney,
54 First Street, Portland, Oregon.
J. H. Denton,
1328 Broadway, New York City, N. Y.
A. W. Arlin,
519 Delta Bldg., Los Angeles, Cal.

Bemis Car Truck Company
Springfield, Mass.



We make a specialty of ELECTRIC RAILWAY LUBRICATION

We solicit a test of TULC
on your equipment
The Universal Lubricating Co.

Cleveland, Ohio
Chicago Representatives: Jameson-Ross Company,
Straus Bldg.

Why



Le Carbone? Carbon Brushes?

Reason No. 10

Their widespread use attests their merit. Such general recognition and adoption can mean only that there is real need for better carbon brushes and that "Le Carbone" Carbon Brushes fill this need.

They talk for themselves

W. J. Jeandron

Factory Terminal Bldg.

Fifteenth Street, Hoboken, N. J.

Pittsburgh Office: 634 Wabash Bldg.

Chicago Office: 1657 Monadnock Block

San Francisco Office: 525 Market Street

Canadian Distributors: Lyman Tube & Supply Co., Ltd.

Montreal and Toronto



STEEL CROSS TIES

insure a permanent, repair-free track. Temperature variations, water or decay will not affect it. ¶ Steel Cross Ties are now being used in practically all new work where economy and permanency are the chief considerations. ¶ If you are interested in "low-maintenance-cost" track, send for a copy of our booklet—Steel Cross Ties.

CARNEGIE STEEL COMPANY

General Offices • Carnegie Building • 434 Fifth Avenue

PITTSBURGH



PENNSYLVANIA



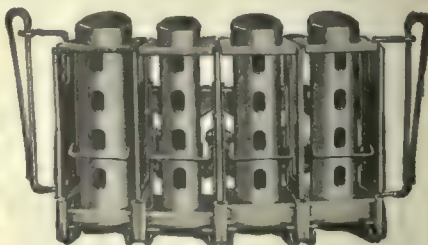
JOHNSON FARE COLLECTING SYSTEMS



Johnson Electric Fare Boxes and overhead registers make possible the instantaneous registering and counting of every fare. Revenues are increased 1½ to 5% and the efficiency of one-man operation is materially increased. Over 4000 already in use.

When more than two coins are used as fare, the Type D Johnson Fare Box is the best manually operated registration system. Over 50,000 in use.

Johnson Change-Makers are designed to function with odd fare and metal tickets selling at fractional rates. It is possible to use each barrel separately or in groups to meet local conditions. Each barrel can be adjusted to eject from one to five coins or one to six tickets.



Johnson Fare Box Co.

4619 Ravenswood Ave., Chicago, Ill.

Used and Surplus Equipment

INDIVIDUAL items of used equipment, or surplus new equipment, or complete plants, are disposed of (and found) through advertising in the *Searchlight* Section of this paper.

This is the section which so effectively aided the Government in selling the many millions of dollars worth of surplus material and equipment accumulated during the war without disturbing the market.

"SEARCHLIGHT"

SEARCHLIGHT SECTION

USED EQUIPMENT & NEW—BUSINESS OPPORTUNITIES

UNDISPLAYED—RATE PER WORD:

Positions Wanted, 4 cents a word, minimum 75 cents an insertion, payable in advance.

Positions Vacant and all other classifications, 8 cents a word, minimum charge \$2.00.

Proposals, 40 cents a line an insertion.

INFORMATION:

Box Numbers in care of any of our offices count 10 words additional in undisplayed ads.

Discount of 10% if one payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED—RATE PER INCH

1 to 3 inches.....\$1.50 an inch
4 to 7 inches.....4.50 an inch
8 to 14 inches.....1.10 an inch
Rates for larger spaces, or yearly rates, on request.
In advertising such is measured vertically (a) one column, 3 columns—30 inches—40 a page.

POSITIONS VACANT

WANTED—Shop foreman of ability and experience to take charge of modern equipment of twenty cars in city of 10,000 within 100 miles of New York City. State age, experience and salary expected. Address, Room 1509, 43 Cedar Street, New York City.

POSITIONS WANTED

working barn foreman can wind armatures do any kind of wiring and controller repairs. 12 years' experience both single and double truck. PW-54, Electric Railway Journal, 1600 Arch St., Phila., Pa.

GENERAL superintendent or manager; fifteen years' successful experience. PW-55, Electric Railway Journal, Tenth Ave. at 36th St., New York.

LES engineer, wide acquaintance in railway and bus industry both manufacturers and operators, desires permanent connections with reliable firm. PW-52, Electric Railway Journal, Guardian Bldg., Cleveland, Ohio.

POSITIONS WANTED

SUPERINTENDENT transportation, qualified by wide experience, fine record in city and interurban operation and coordination rail and bus service. Exceptional ability in dealing successfully with labor, public, public officials, resulting in increased revenue, reduced operating costs. A progressive efficient operating official with high grade references. Correspondence invited. PW-53, Electric Railway Journal, Guardian Bldg., Cleveland, Ohio.

WOULD like to correspond with any company needing a high-grade official in any capacity, in city or interurban railways. Can manage any or all departments in the most efficient manner. PW-53, Electric Railway Journal, Guardian Bldg., Cleveland, O.

S EARCHLIGHT
E RVICE
E CURES
A TISFACTORY
A LES

CURTAIN SUPPLY CO.

Moving to larger office same building will sublet present office 583 square feet including private office all over-looking Hudson River.

50 Church St., Hudson Terminal Bldg., New York City

WANTED

20 Westinghouse 306—C.V. 4.
20 K. 36—J Controllers.

W-51, Electric Railway Journal
Tenth Ave. at 36th St., New York City

FOR SALE

15 BIRNEY SAFETY CARS
Brill Built

West, 508 or G. E. 264 Motors
Cars Complete—Low Price—Fine Condition
ELECTRIC EQUIPMENT CO.
Commonwealth Bldg., Philadelphia, Pa.

Saving is a good habit, BUT— Why Save Things You'll Never Use?

WHY let Mother Nature grow grass between the wheels of replaced cars? Why pile up rails, shop equipment, power plant equipment, line equipment, car appliances, road building material, etc., etc., you will never use again?

TODAY you can turn them over at a fair price. Tomorrow they will be—JUNK. Is it not the better part of good horse-sense to dispose of them NOW?

6000 other electric railway men will see your advertisements of used or surplus equipment and materials here—in the Searchlight Section of their business paper.

Some of these men—officials or executives of other lines in other parts of the country and operating under different conditions—can use what you no longer need. For an insignificant investment you

can tell these others what you have. And they will buy.

One "Searchlight" advertiser wrote, "We can cheerfully recommend the Searchlight Section as a wonderful medium for reaching buyers of rails and equipment." Another—"The strongest proof that your 'Searchlight' finds its way to many readers is shown by the numerous letters we have received in answer to our recent ad."

Let us tell you the cost of advertising your used or surplus equipment and materials in the Searchlight Section. Just address a list of what you have to dispose of to the

Searchlight Department

ELECTRIC RAILWAY JOURNAL

Tenth Ave. at 36th St., New York, N. Y.

WHAT AND WHERE TO BUY

Equipment, Apparatus and Supplies Used by the Electric Railway Industry
with Names of Manufacturers and Distributors Advertising in this Issue

Advertising, Street Car
Collier, Inc., Barron G.
Air Brakes
Westinghouse Air Brake Co.
Anchors, Guy
Elec. Service Supplies Co.
Ohio Brass Co.
Westinghouse E. & M. Co.
Armature Shop Tools
Columbia Machine Works
Elec. Service Supplies Co.
Automatic Return Switch
Stands
Ramapo Ajax Corp.
Automatic Safety Switch
Stands
Ramapo Ajax Corp.
Axles
Bemis Car Truck Co.
Bethlehem Steel Co.
Brill Co., The J. G.
Carnegie Steel Co.
Cincinnati Car Co.
St. Louis Car Co.
Standard Steel Works
Westinghouse E. & M. Co.
Babbitt Metal
National Bearing Metals
Corp.
Babbitt Devices
Columbia Machine Works
& M. I. Co.
Bags and Buttons
Elec. Service Supplies Co.
International Register Co.
Batteries, Dry
Nichols-Lintern Co.
Bearings and Bearing Metals
Bemis Car Truck Co.
Brill Co., The J. G.
Cincinnati Car Co.
Columbia Machine Works &
M. I. Co.
General Electric Co.
National Bearing Metals
Corp.
St. Louis Car Co.
Westinghouse E. & M. Co.
Bearings, Center and Roller
Side
Cincinnati Car Co.
Columbia Machine Works
Stucki Co., A.
Bells and Banners
Consolidated Car Heating
Co.
Bells and Gongs
Brill Co., The J. G.
Cincinnati Car Co.
Columbia Machine Works &
M. I. Co.
Elec. Service Supplies Co.
St. Louis Car Co.
Benders, Rail
Railway Trackwork Co.
Bodies, Bus
Brill Co., The J. G.
Lang Body Co.
St. Louis Car Co.
Body Material, Haskellite &
Plymetal
Haskellite Mfg. Corp.
Bolters
Babcock & Wilcox Co.
Bond Testers
American Steel & Wire Co.
Elec. Service Supplies Co.
Bonding Apparatus
American Steel & Wire Co.
Elec. Service Supplies Co.
Ohio Brass Co.
Railway Trackwork Co.
Una Welding & Bonding Co.
Bonds, Rail
American Steel & Wire Co.
Elec. Service Supplies Co.
General Electric Co.
Ohio Brass Co.
Railway Trackwork Co.
Una Welding & Bonding Co.
Westinghouse E. & M. Co.
Book Publishers
McGraw-Hill Book Co.
Brackets and Cross Arms
(See also Poles, Ties,
Posts, etc.)
Bates Expanded Steel
Truss Co.
Columbia Machine Works
Elec. Ry. Equipment Co.
Elec. Service Supplies Co.
Hubbard & Co.
Ohio Brass Co.
Brake Adjusters
Brill Co., The J. G.
Cincinnati Car Co.
National Ry. Appliance Co.
Westinghouse Tr. Br. Co.
Brake Shoes
American Brake Shoe &
Foundry Co.
Bemis Car Truck Co.
Brill Co., The J. G.
St. Louis Car Co.
Brake Testers
National Ry. Appliance Co.
Brakes, Brake Systems and
Brake Parts
Bemis Car Truck Co.
Brill Co., The J. G.
Cincinnati Car Co.
Columbia Machine Works
& M. I. Co.
General Electric Co.

National Brake Co.
Safety Car Devices Co.
St. Louis Car Co.
Westinghouse Tr. Br. Co.
Brakes, Magnetic Rail
Cincinnati Car Co.
Brushes, Carbon
General Electric Co.
Jeandron, W. J.
LeCarbone Co.
Morganite Brush Co.
Westinghouse E. & M. Co.
Brushes, Graphite
Morganite Brush Co.
Brushholders
Columbia Machine Works
Bulkheads
Haskellite Mfg. Corp.
Buses
Graham Bros.
White Company
Yellow Truck & Coach Co.
Bus Lighting
National Ry. Appliance Co.
Bushings, Case Hardened
and Manganese
Bemis Car Truck Co.
Brill Co., The J. G.
Cincinnati Car Co.
Columbia Machine Works
St. Louis Car Co.
Cables (See Wires and
Cables)
Cambrie Tapes, Yellow and
Black Varnish
Irvington Varnish & Ins.
Co.
Carbon Brushes (See
Brushes, Carbon)
Car Lighting Fixtures
Elec. Service Supplies Co.
Car Panel Safety Switches
Consolidated Car Heating
Co.
Westinghouse E. & M. Co.
Car Steps, Safety
Cincinnati Car Co.
Car Wheels, Rolled Steel
Bethlehem Steel Co.
Cars, Dump
Brill Co., The J. G.
Differential Steel Car Co.
St. Louis Car Co.
Cars, Gas-Electric
Brill Co., The J. G.
General Electric Co.
Westinghouse E. & M. Co.
Cars, Gas, Rail
Brill Co., The J. G.
St. Louis Car Co.
Cars, Passenger, Freight,
Express, etc.
American Car Co.
Brill Co., The J. G.
Cincinnati Car Co.
Kuhlman Car Co., G. C.
St. Louis Car Co.
Wason Mfg. Co.
Cars, Second Hand
Electric Equipment Co.
Cars, Self-Propelled
Brill Co., The J. G.
General Electric Co.
Castings, Brass Composition
or Copper
Cincinnati Car Co.
Columbia Machine Works &
M. I. Co.
National Bearing Metals
Corp.
Castings, Gray Iron and
Steel
American Bridge Co.
American Steel Foundries
Bemis Car Truck Co.
Columbia Machine Works &
M. I. Co.
St. Louis Car Co.
Standard Steel Works
Castings, Malleable & Brass
Bemis Car Truck Co.
Columbia Machine Works &
M. I. Co.
St. Louis Car Co.
Catchers and Retrievers,
Trolley
Elec. Service Supplies Co.
Ohio Brass Co.
Wood Co., Chas. N.
Catenary Construction
Archbold-Brady Co.
Ceilings, Car
Haskellite Mfg. Corp.
Ceilings, Plywood Panels
Haskellite Mfg. Corp.
Change Carriers
Cleveland Fare Box Co.
Elec. Service Supplies Co.
Change Trays
Cincinnati Car Co.
Circuit-Breakers
General Electric Co.
Westinghouse E. & M. Co.

Clamps and Connectors for
Wires and Cables
Columbia Machine Works
Elec. Ry. Equipment Co.
Elec. Service Supplies Co.
General Electric Co.
Hubbard & Co.
Westinghouse E. & M. Co.
Cleaners and Scrapers, Track
(See also Snow-Plows,
Sweepers and Brooms)
Brill Co., The J. G.
Cincinnati Car Co.
Ohio Brass Co.
St. Louis Car Co.
Clusters and Sockets
General Electric Co.
Coil Banding and Winding
Machines
Columbia Machine Works &
M. I. Co.
Elec. Service Supplies Co.
Westinghouse E. & M. Co.
Colls, Armature and Field
Columbia Machine Works &
M. I. Co.
General Electric Co.
Westinghouse E. & M. Co.
Colls, Choke and Kicking
Elec. Service Supplies Co.
General Electric Co.
Westinghouse E. & M. Co.
Coil Changers
Johnson Fare Box Co.
Coin Counting Machines
Cleveland Fare Box Co.
International Register Co.
Johnson Fare Box Co.
Coin Sorting Machines
Cleveland Fare Box Co.
Johnson Fare Box Co.
Coin Wrappers
Cleveland Fare Box Co.
Commutator Slotters
Columbia Machine Works
Elec. Service Supplies Co.
General Electric Co.
Westinghouse E. & M. Co.
Wood Co., Chas. N.
Commutator Truing Devices
General Electric Co.
Commutators or Parts
Columbia Machine Works &
M. I. Co.
General Electric Co.
Westinghouse E. & M. Co.
Compressors, Air
General Electric Co.
Westinghouse Tr. Br. Co.
Condensers
General Electric Co.
Westinghouse E. & M. Co.
Condenser Papers
Irvington Varnish & Ins.
Co.
Connectors, Solderless
Westinghouse E. & M. Co.
Connectors, Trailer Car
Columbia Machine Works
Consolidated Car Heating
Co.
Elec. Service Supplies Co.
Ohio Brass Co.
Controllers or Parts
Columbia Machine Works &
M. I. Co.
General Electric Co.
Westinghouse E. & M. Co.
Controller Regulators
Elec. Service Supplies Co.
Controlling Systems
General Electric Co.
Westinghouse E. & M. Co.
Converters, Rotary
General Electric Co.
Westinghouse E. & M. Co.
Copper Wire
American Brass Co.
American Steel & Wire Co.
Anaconda Copper Mining
Co.
Copper Wire Instruments,
Measuring, Testing and
Recording
American Brass Co.
Anaconda Copper Mining Co.
Cord, Bell, Trolley, Register
American Steel & Wire Co.
Brill Co., The J. G.
Elec. Service Supplies Co.
International Register Co.
Roebbling's Sons Co., John A.
St. Louis Car Co.
Samson Cordage Works
Cord Connectors and
Couplers
Elec. Service Supplies Co.
Samson Cordage Works
Wood Co., Chas. N.
Couplers, Car
American Steel Foundries
Brill Co., The J. G.
Cincinnati Car Co.
St. Louis Car Co.
Ohio Brass Co.

Westinghouse Traction
Brake Co.
Cowl Ventilators
Nichols-Lintern Co.
Cranes, Hoists & Lifts
Electric Service Supplies Co.
Cross Arms (See Brackets)
Crossing Foundations
International Steel Tie Co.
Crossings
Ramapo Ajax Corp.
Wm. Wharton, Jr. & Co.
Crossings, Frogs & Switches
Ramapo Ajax Corp.
Wm. Wharton, Jr. & Co.
Crossings, Manganese
Bethlehem Steel Co.
Ramapo Ajax Corp.
Wm. Wharton, Jr. & Co.
Crossings, Track (See Track
Special Work)
Crossings, Trolley
Ohio Brass Co.
Westinghouse E. & M. Co.
Curtains & Curtain Fixtures
Brill Co., The J. G.
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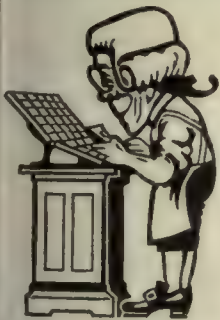
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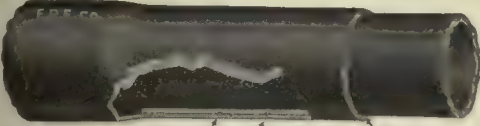
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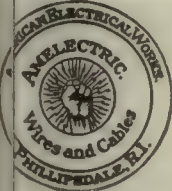
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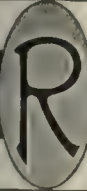
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in this space in all issues where larger display space is not used backs up your advertising campaign and keeps your name in the classified section.

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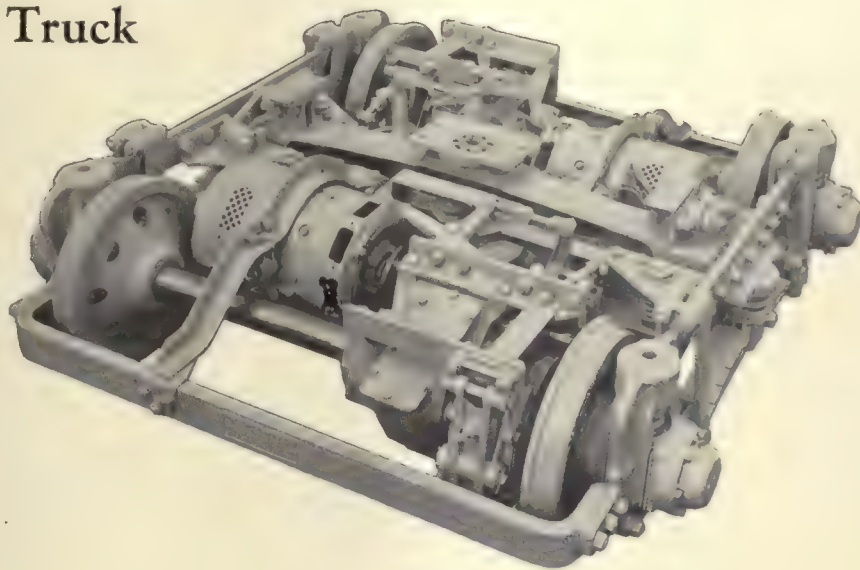
Convention

Most everyone did, and most everyone took the opportunity to look it over very carefully. So many interesting features were included in this "1928 Model" electric car that delegates could not help but appreciate the fact that an important "advance in the car-building art" had been accomplished. Its low graceful appearance, the floor being only 28¾ in. above the rail, its unusually wide 42-in. post centers which with a sloping windshield at each end not

only afforded maximum unobstructed vision but also contributed to the bright and cheerful interior, and its beautiful walnut interior finish harmonizing with deep spring leather upholstered seats won the approval of the delegates.



Brill No. 277-Ex. Truck



Brill 1928 Model Car

With unique motor and brake
arrangement to minimize noise

Set out in front to afford close inspection, the Brill 277-EX truck under the "1928 Model" attracted considerable attention. With the motors supported on the truck frame and driving each axle through a double reduction gear unit in oil, and the use of clasp shoe brakes on axle drums, delegates were impressed by the practicability of the arrangement. The possibility of noise

reduction without deviating from truck design of proven merit was readily recognized. Such principles in design as outside journals, graduated spring system and the floating bolster which contribute to the riding comfort and ready maintenance of conventional trucks were included in the trucks under the Brill 1928 Model Electric Car.

Watch this space for further information.



THE J. G. BRILL COMPANY
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After a Hard Winter



AFTER a hard winter, with its strains and heavy going, bus operators find their Gas-Electrics in much better shape than the mechanical-drive buses. This means lower maintenance and depreciation.

Abuse such as racing, stalling, or jerky applications of power is impossible with Gas-Electric drive.

Gas-Electric equipment is now available in three standard sizes—for light and medium duty in city and interurban service, and double-deck for city operation.



GENERAL ELECTRIC

ELECTRIC RAILWAY JOURNAL

Hill Publishing Company, Inc.

October 29, 1927

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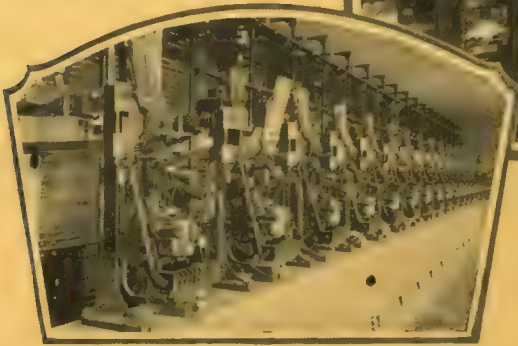
THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

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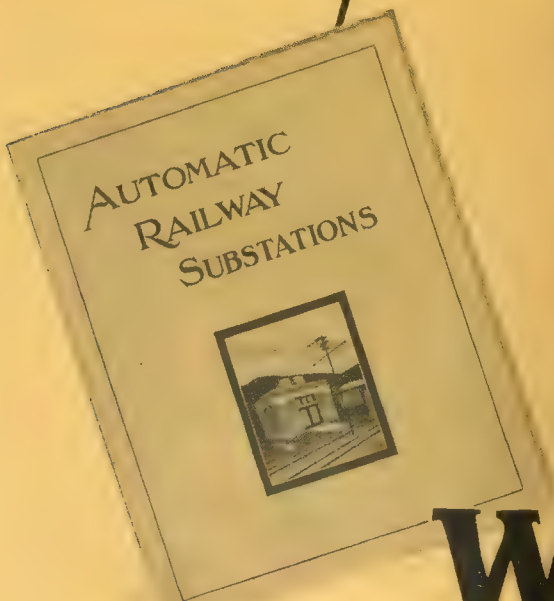


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Switchboard, Install-
ed by the Indiana-
polis Street Railway
Company →

Indianapolis Street
Railway's Installation of
Type CH Interrupters. ↓



the book
shows
how
and
why



AUTOMATIZE!

"NEW installations of railway substations are, in most instances, connected with the extension or modification of existing transportation systems. In such cases, it is usually the purpose to effect several results such as, increase of system capacity, replacement of obsolete, inefficient or worn-out equipment, reduction of excessive investment in feeder copper or improvement of voltage conditions. Where a complete new system is to be installed, the problem is somewhat changed and simplified in certain details, but the fundamental considerations are, in general the same. It must be constantly borne in mind that the ultimate purpose is to convert a-c. energy into transportation service, which, in turn, must measure up to certain predetermined standards". (Excerpt from Publication C-1793, Automatic Railway Substations).

This circular has as its purpose a complete outline of the major economic and engineering considerations, mentioned above, and to point out those features which are essential to successful operation.

Our nearest district office has your copy of Publication C-1793. Ask for it at your earliest convenience.

SOME SUBJECTS COVERED

Systems Studies.	D-C. Machine and
Selection of Conversion	Feeder Protection.
Equipment.	Substation Buildings.
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Autumn

MIGHTY trees are discarding their gorgeous raiment of gold, bronze and red leaves these autumn days. For them it marks another epoch in their growth of progress. Each year their spreading branches reflect the dynamic force that is causing them to forge ahead. The old leaves have served their purpose and are consigned to oblivion.

So with the industry as with nature, there must be a potential power working to bring forth new and better equipment. When the old has served its purpose it should follow the leaves. Each year, despite the buffeting of storm and wind the mighty oak, symbol of strength and hardiness, typifies the determination and courage of the industry to reach greater heights.

Like the forester the JOURNAL steadfastly and carefully watches for any signs of decaying obsolescence, points with pride to twigs of progress that hold the buds of new developments and garners the acorns of statistics to show what a vital factor the street car is in the life of the nation.

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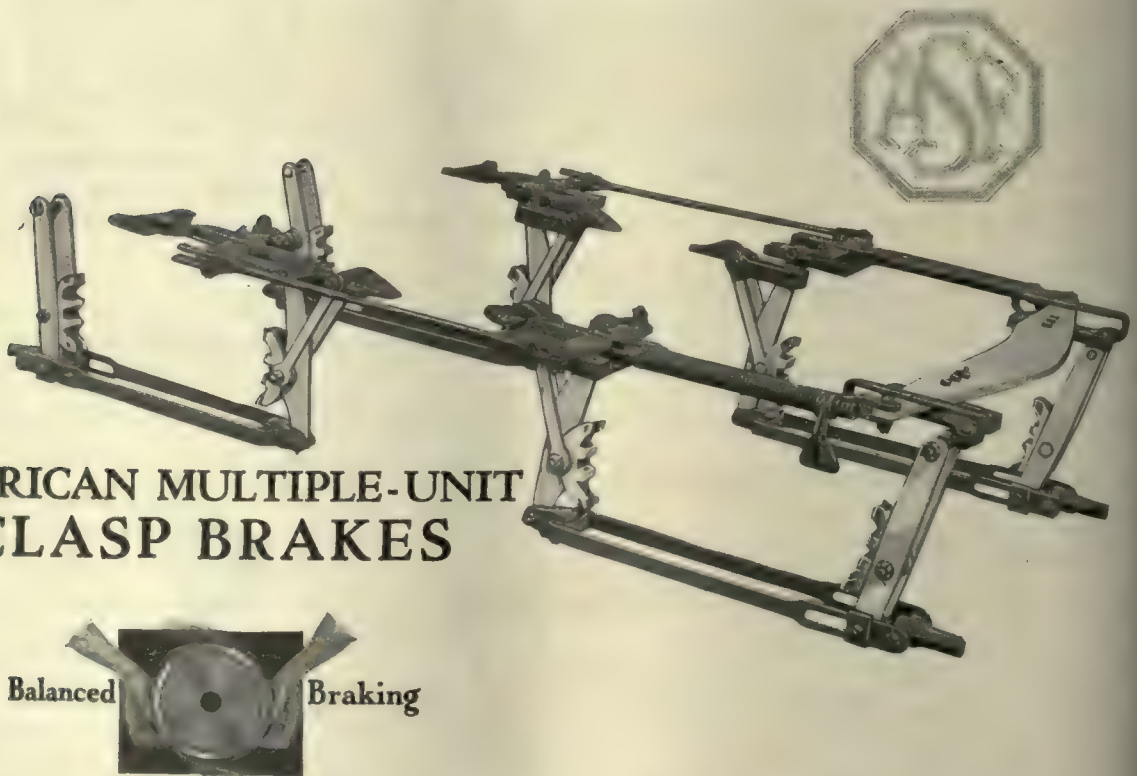
AS LOGICAL AS THE BALANCING OF SCALES



To obtain the unknown weight of an object, by balancing it with known weights was one of the earliest scientific developments. This principle of equalization of forces has had countless practical applications. It is logical.

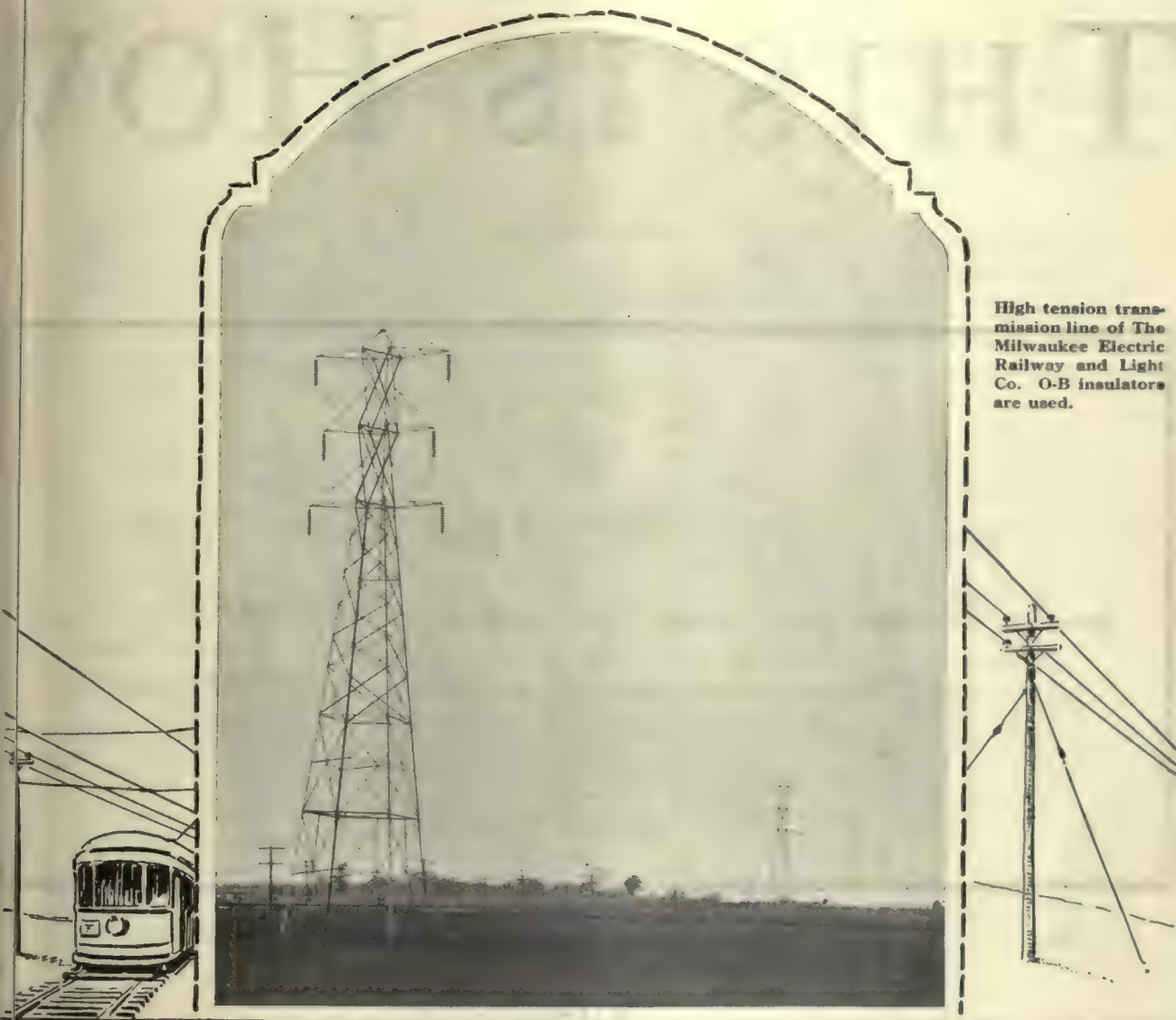
In the modern railway clasp brake, equal pressure is applied to opposite sides of each wheel, through standard brake shoes, whereas the ordinary practice is to apply the force to one side only. The clasp brake, or balanced braking system, neutralizes the tendency to one-sided wear on journal bearings, pedestals and other truck parts. It affords smoother braking with less heating of brake shoes, and reduces the number of "slid-flat" wheels.

In short—it is the modern and scientific braking system—which is finding increasing favor for heavy traction, and rapid transit service.



AMERICAN MULTIPLE-UNIT
CLASP BRAKES

AMERICAN STEEL FOUNDRIES
NEW YORK CHICAGO ST. LOUIS



High tension transmission line of The Milwaukee Electric Railway and Light Co. O-B insulators are used.

Select only Proved Insulators. They will Pay Real Profits in the end

It is wasteful to save a little in insulator first cost and lose many dollars later in labor and materials for premature replacement.

It is economy to take the necessary time to make sure you are selecting those insulators whose long life has been well proved. It is not the first cost but the cost per year during their life which gives the final measure of economy.

You would expect the large electric power companies to have

established insulator values pretty definitely after having bought, installed and recorded performance records of many millions of them.

Indicative of the collective opinion of these power companies is the fact that over 50% of major transmission lines are O-B insulated. The significant thing for you in this is the fact that economy of using O-B insulators is

demonstrated by the preponderance of their use, and by the further fact that all O-B insulators of all sizes from small pin types to massive bushings are manufactured with identical materials and inspected and tested under exactly the same procedure.

Care in making sure you buy insulators whose records in service have proved them to be longest-lived, pays dollars in profit later because replacements are long postponed.

Ohio Brass Company, Mansfield, Ohio
Dominion Insulator & Mfg. Co., Limited
Niagara Falls, Canada
468H

Ohio Brass Co.

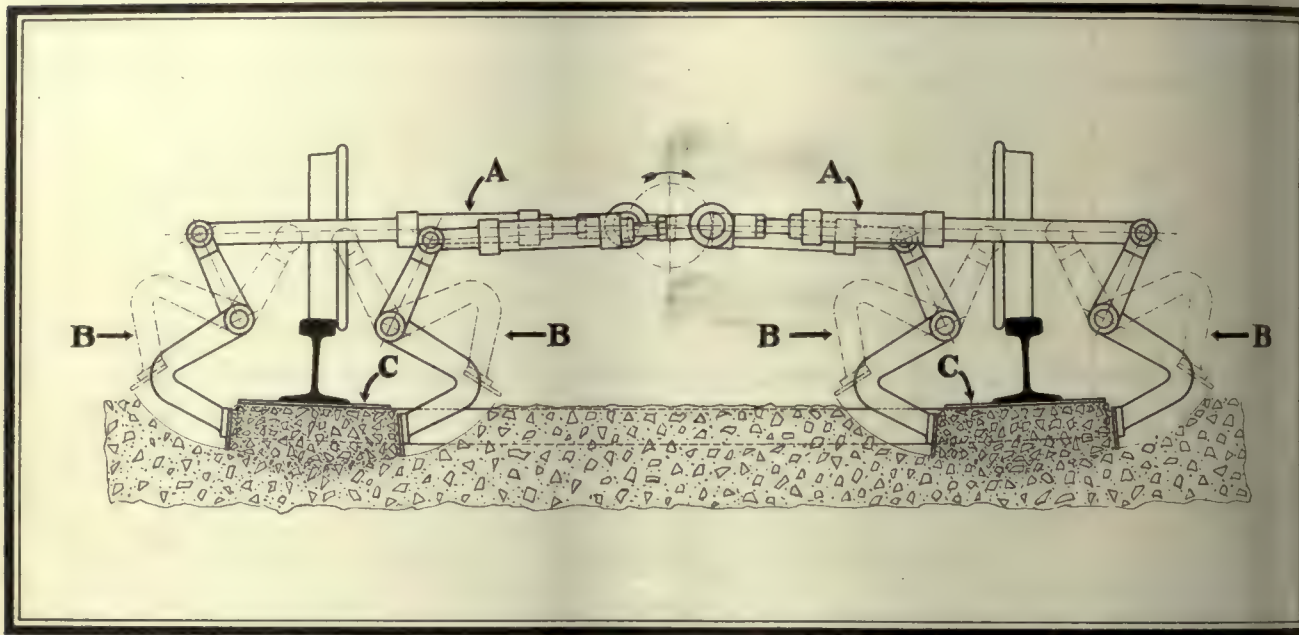


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CAR EQUIPMENT
MINING
MATERIALS
VALVES

THIS IS HOW



Cross section view of tamper showing operation

The COMPRESSION TAMPER

—will be made by the International Steel Tie Co.,
Cleveland, Ohio, in the interests of better, more lasting
track construction.

STEEL TWIN

T WORKS—



1½ H.P.-550 D.C. all weather motor operating through a worm gear, drives the crank shaft which actuates four connecting rods (A), with spring cylinders for give and take, which drive the tamping arms (B), the latter acting simultaneously on opposite sides of the tie plate (C) on both rails. The tamping arms have a speed of 20 strokes per minute, giving the machine a theoretical production of 6000 feet of track per day.

The concrete is forced under the plate at a pressure of 400 lbs. As the tamping arms (B) start on their downward stroke the concrete, which flows between, is forced under the tie plate (C) from opposite sides. As the tamping arms continue their stroke, the concrete is forced against the subgrade and the bottom of the tie plate. In demonstrations, it has been possible to make this force so great as to actually lift the entire tie and rail structure giving absolute evidence that the concrete was bearing 100% against the tie plate, and was going into compression—forcing out all air and water pockets, and giving a more dense mixture.

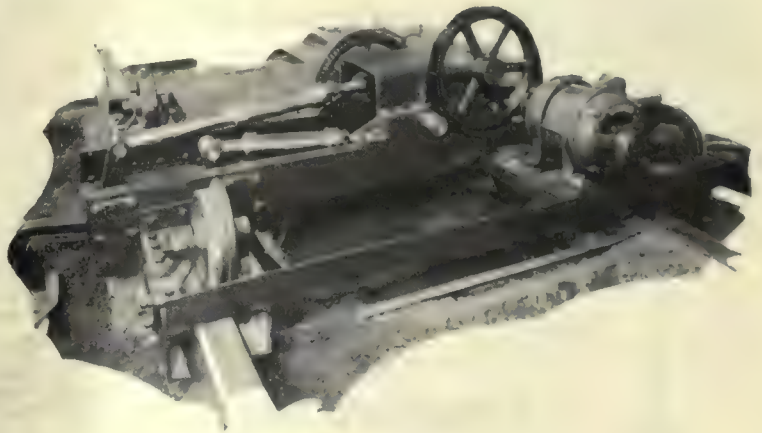
The operator, who rides the machine, controls the track speed by moving the machine by hand. A slight turn of one of the track wheels easily moves the machine. A punch press type of clutch starts the tamper, and can be locked for continuous operation.

The compression tamper removes the human element from track construction guaranteeing absolute 100% concrete bearing against the tie and rail, with total absence of voids and water pockets.

These compression tampers will be available for your 1928 track program. Arrangements should be made now for special track gauges.

The International
Steel Tie Company

Cleveland, Ohio



Photograph of the Compression Tamper in actual operation

TIE TRACK



HIGH SPEED and SAFETY

WHEN YOUR interurban cars are clipping off the miles at a high speed you want to know that you have safeguarded your patrons and your reputation. "Standard" rolled steel wheels are built to stand up with the maximum of safety under all conditions.



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Axles
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Springs



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Golden Glow



Protection!

Police regulation of traffic has eliminated much confusion and greatly increased safety for both pedestrians and vehicles. Yet police regulation is the most limited at night when danger is greatest.

Protect your service against accidents during these hours by means of proper headlights—Golden Glow Headlights that project the well-known, non-glaring but penetrating Golden Glow light.

Our latest pamphlets describe the various styles and sizes. Write today for your copies.



Type DG Golden Glow Headlight for city service. Being fitted with a Golden Glow private reflector it illuminates a wide area adjacent to and for about 50 feet ahead of the car.

Home office and plant at 17th & Cambria Sts., PHILADELPHIA; District offices at 280 So. Clark St., CHICAGO; 50 Church St., NEW YORK; Bessemer Bldg., Pittsburgh; 88 Broad St., Boston; General Motors Bldg., Detroit; 316 N. Washington Ave., Scranton; Canadian Agents, Lyman Tube & Supply Company, Ltd., Montreal, Toronto, Vancouver.

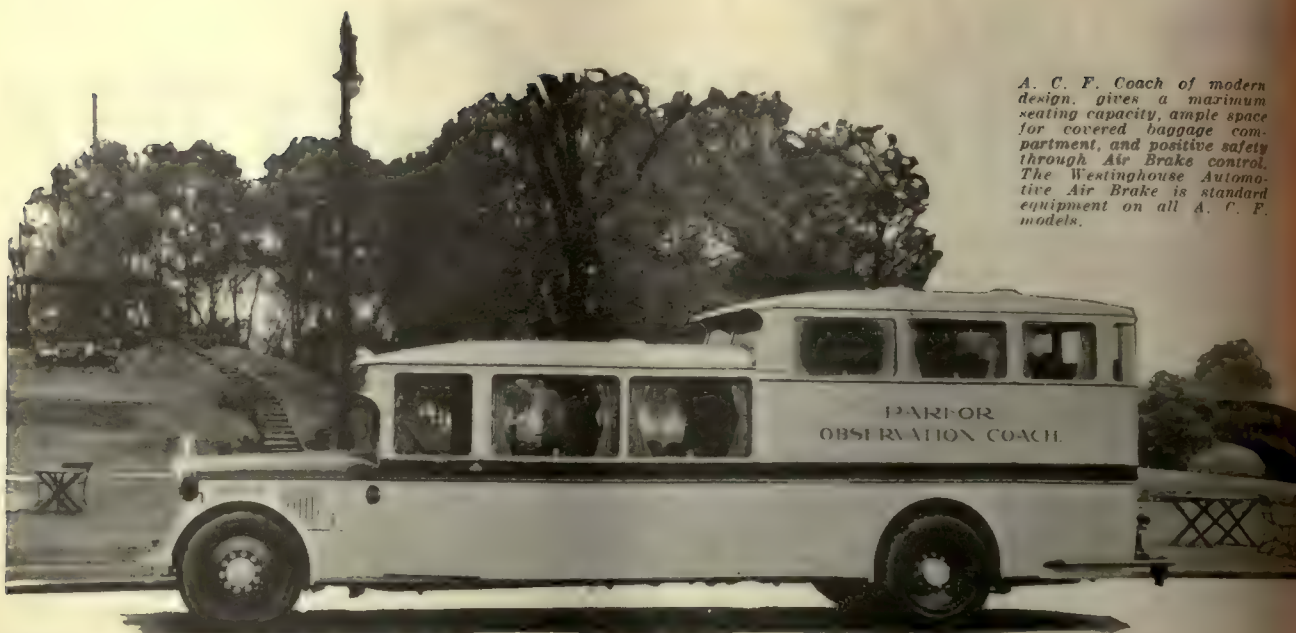
Type R Golden Glow Railway Headlights are made in various types and fitted with either 9-inch or 12-inch diameter Golden Glow reflectors for suburban and interurban service.

ELECTRIC SERVICE SUPPLIES Co.

MANUFACTURER OF RAILWAY POWER

AND INDUSTRIAL ELECTRICAL MATERIAL





A. C. F. Coach of modern design, gives a maximum seating capacity, ample space for covered baggage compartment, and positive safety through Air Brake control. The Westinghouse Automotive Air Brake is standard equipment on all A. C. F. models.

There is something more than Safety in the Westinghouse Automotive Air Brake

Combatting the ever present evil of "brake riding," the Westinghouse Automotive Air Brake has come to be recognized not alone for its positive, safe, quick action—but as a potent economic necessity.

We feel safe in saying that more than half the expense of brake lining is wasted through nervous anticipation on the part of the driver, which is known as "brake riding"—the direct unconscious result of lack of confidence in ordinary brakes.

With the Westinghouse Automotive Air Brake, responsive to the slightest touch, unnecessary braking is minimized if not entirely eliminated, drivers are in turn relieved from undue mental and physical strain . . . and, as a consequence, an entire service is bettered.

Cut your braking expense . . . insure safety . . . get fuller information on the many advantages of the Westinghouse Automotive Air Brake from any of our conveniently located offices. This service is maintained for the exclusive use of the coach operator and is in no way obligatory.



The Westinghouse Air Brake is standard equipment on many of the most prominent coaches on many others it is optional equipment, approved and recommended by the manufacturer who is equipped to install the system upon specification.

6200

WESTINGHOUSE TRACTION BRAKE COMPANY
Automotive Brake Division: WILMERDING, PENNA.

WESTINGHOUSE AUTOMOTIVE AIR BRAKES

A STUDEBAKER BUS *officially opens the Snow Locked* McKenzie Pass



Successfully bucking its way through deep drifts, a 21-passenger Studebaker Bus officially opened the famous McKenzie Pass Highway in June. This road, which crosses the Cascades at an elevation of 5200 feet, is snowbound six months of the year—drifts 20 feet deep form in the lava field offering an almost impassable barrier. Highway crews with a rotary plow spent weeks breaking the trail most of the way. The engineers of the Oregon Highway Commission in a Studebaker Bus, piloted by M. A. Reed, Superintendent of the Oregon Stages, Inc., inspected the opened highway and rode in comfort while the powerful bus tore through the remaining miles of deep snow.

STUDEBAKER **75** HEAVY DUTY CHASSIS

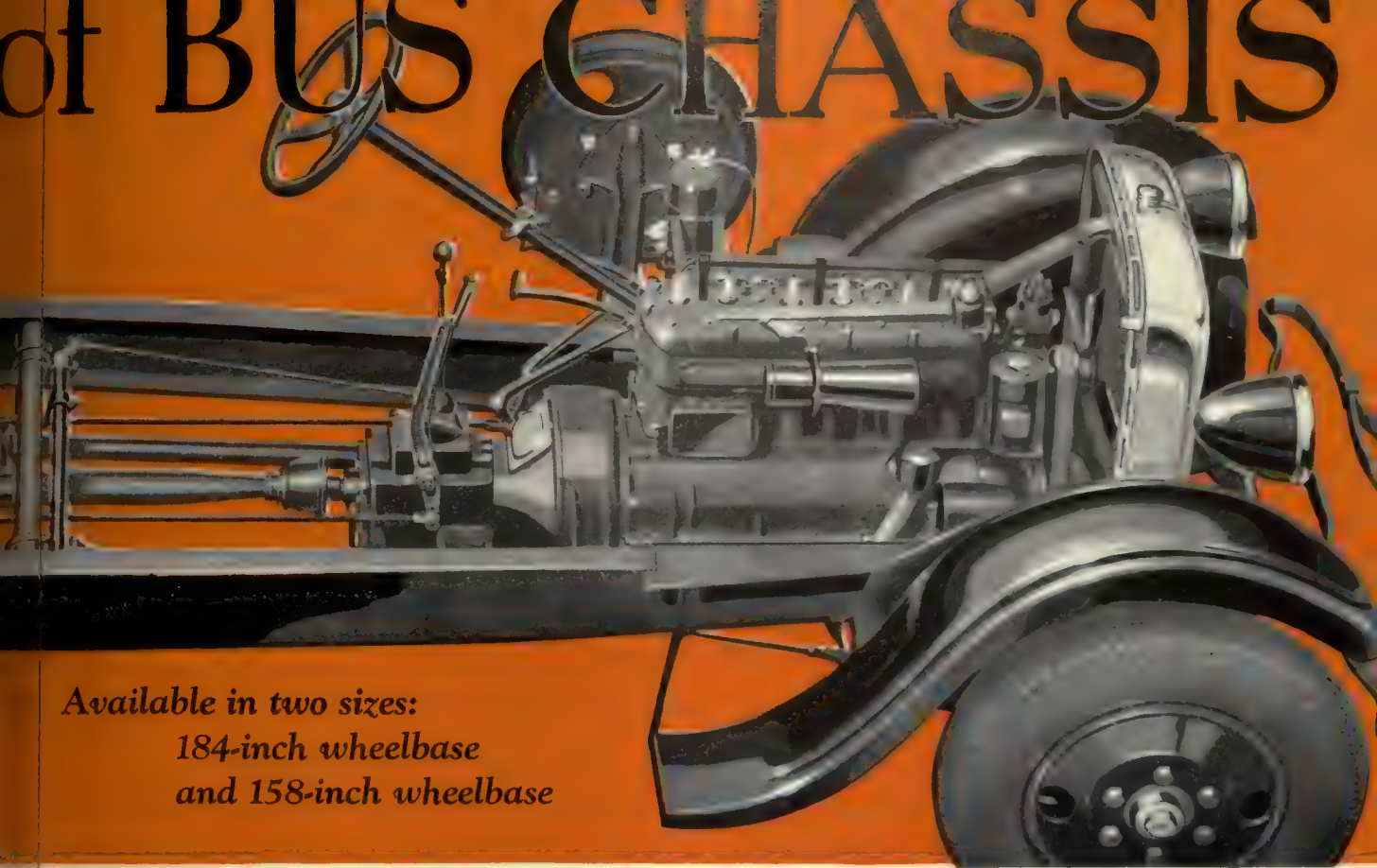
The MOST TALKED in America



The one street car type bus which
 possesses the essential elements for
 later profits is a Studebaker.
 It is as sturdy in both chassis and
 body as present engineering practice
 will permit.
 Low first cost, low operating cost
 and low depreciation mark this bus
 as a profit maker.
 The deep leather upholstery, wide
 vision and unobstructed vision give a
 new sense of riding comfort not ordinarily
 found in street car busses.

The New STUDEBAKER 75 HEAVY DUTY

of BUS CHASSIS



*Available in two sizes:
184-inch wheelbase
and 158-inch wheelbase*

BROUGHT out in March, this year, the Studebaker "75" bus chassis has met with unusual success. Unqualified endorsement in the tangible form of orders from operators in all parts of the country, proves that this new type of chassis has met with popular favor.

built for the heavy demands of street car service, this chassis is a masterpiece of rugged construction. Its stamina has been proved by thousands of miles of guelling tests across the country and on the Studebaker proving ground.

low center of gravity, obtained by a "kick-up" frame, prevents side-sway which is further kept up by the short shackles and wide springs. The result is greater safety and greater riding comfort. Nine stout cross-members, including two large subar units, give great rigidity to the 8-inch pressed steel frame. The transmission is of the 4-speed forward type—specially designed—as was the heavy duty rear axle.

Every operator of a Studebaker Bus knows, the Studebaker 75-horsepower motor is remarkably quiet and possesses a power reserve ample for the most strenuous schedules or difficult routes.

Because of the immediate acceptance of the "75" chassis, a demand developed for a chassis of similar

durability and power but designed for 12 to 18-passenger capacity. This is now offered in the "75" Junior chassis which possesses all of the essential features of the "75" except that it is 28 inches shorter, has one less cross-member and has a 3 speed forward transmission.

If you haven't seen the Studebaker "75" chassis ask your nearest Studebaker distributor to show you this latest development in bus engineering.

Studebaker Bus Models and Prices

"75" Model—184" Wheelbase—Dual Rear Wheels Chassis Only	\$3275
19-passenger Cross-seat Sedan*	5675
21-passenger Street Car Bus	5895
22-passenger Parlor Observation Car	6895
20-passenger Parlor Car De Luxe	6895
*Single rear wheels; for dual wheels add \$100.	

"75" Junior Model—158" Wheelbase

Chassis Only	\$2410
12-passenger Cross-Seat Sedan	4160
15-passenger Cross-Seat Sedan	4520
Single wheel high pressure tires or dual wheels and balloon tires optional without extra cost.	

All prices f.o.b. factory. Purchase can be arranged on Studebaker's liberal budget payment plan

Mail
co
for fu
partic
THE STUDEBAKER
CORPORATION
OF AMERICA
Dept. B, South B
Ind.

Please send me a copy of Studebaker "Busses Link the Nation," without obligation.

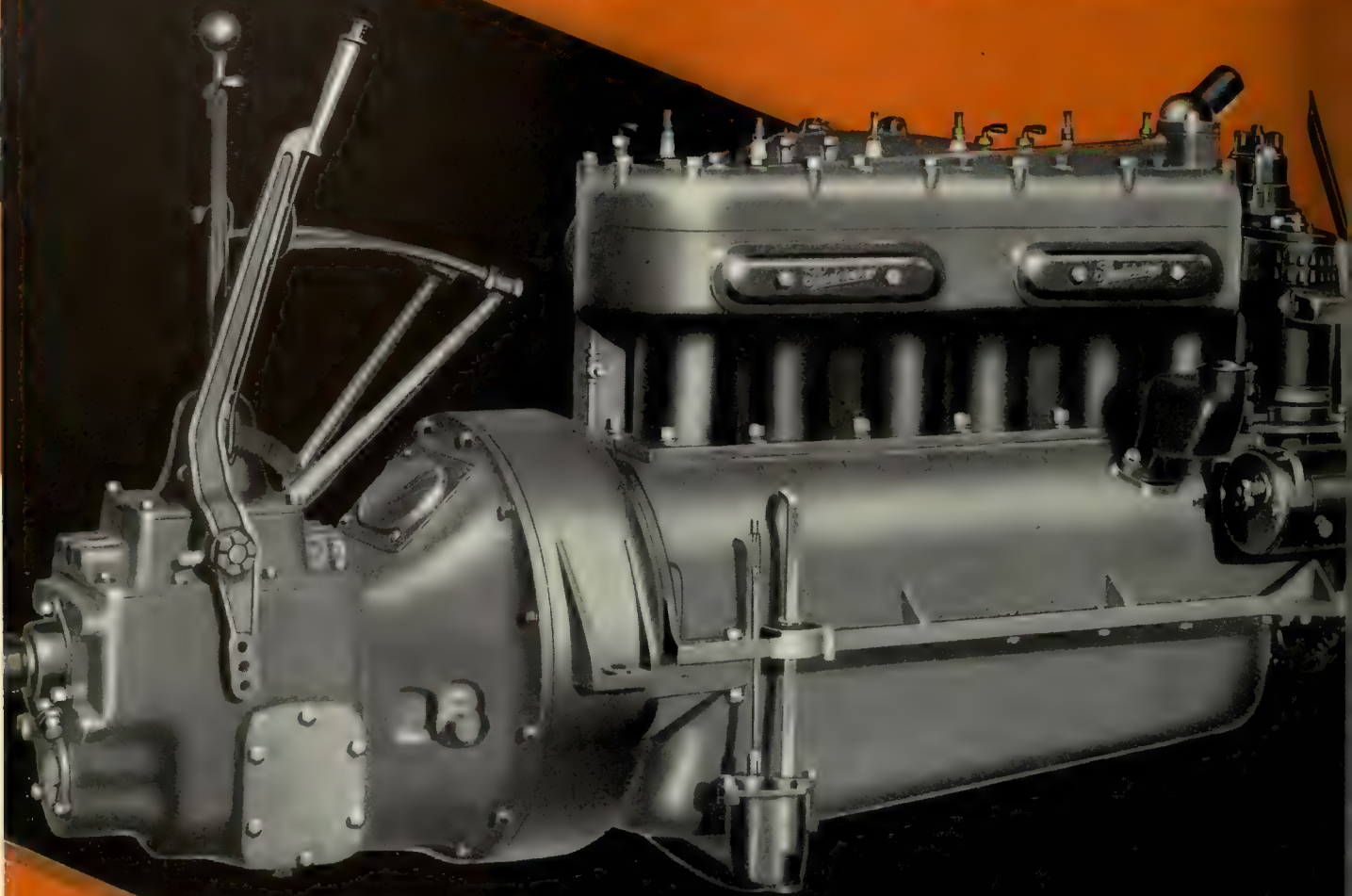
We have buses at present. Circle below the Studebaker Bus about which you desire information. Type: Sedan Parlor Car Street Car Type Capacity Passenger

Name

Address

DUTY CHASSIS

POWER PLUS SPEED



UNDER the hood of all Studebaker busses is the sturdy high-powered, six-cylinder engine that has earned the respect of bus operators everywhere for its unfailing ability to maintain schedules regardless of the loads carried or adverse conditions of road or weather.

Long fast runs under boiling rays of 100° sun, up steep mountain grades, bucking heavy snow or pulling through soft muddy roads—the Studebaker motor comes through on time—every time and no favors asked.

Designed and manufactured by Studebaker, this powerful engine is of the quiet L-head type. Compact unit power plant is mounted on its own subframe to insure perfect alignment between engine and transmission.

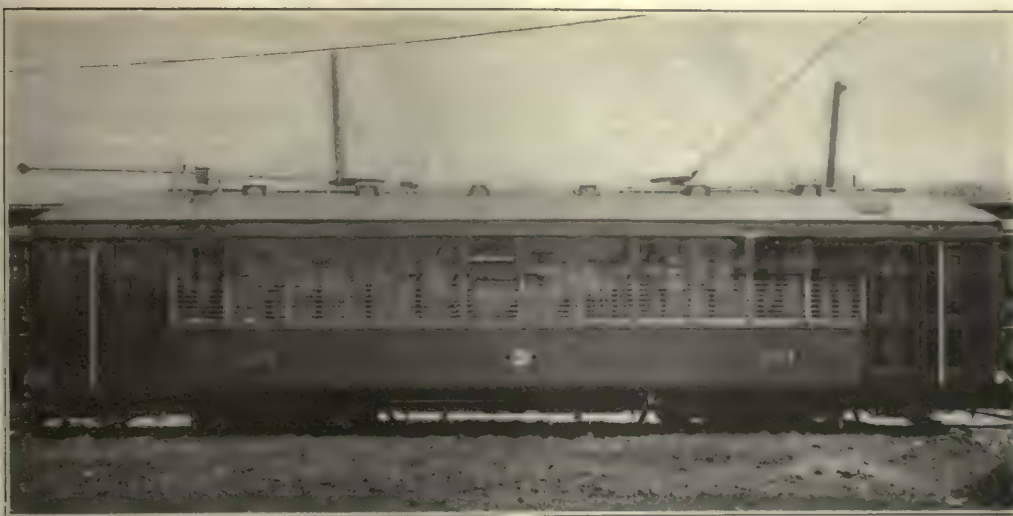
The bore is $3\frac{7}{8}$ inches and the stroke is 5 inches. Removable head, with combustion chambers exactly machined to uniform size.

The precision exercised in the building of Studebaker engines plus the quality of materials used, insure exceptionally long life and dependable, economical performance.

Many letters, received from bus operators in every section of the country, comment on the excess power and superlative performance of this famous Studebaker motor. Owners frequently operate their busses continuously on runs averaging between 200 and 300 miles a day, seven days in the week for months at a time without any attention other than changing the oil.

STUDEBAKER **75** HEAVY DUTY CHASSIS

MILWAUKEE



NP

MORE TREADLES FOR MILWAUKEE

MILWAUKEE was one of the first large cities to see the value of the Treadle Exit Door.

After an exhaustive test 162 treadle equipped cars were placed in service in Milwaukee in 1926.

In 1927 Milwaukee will have 232 Treadle Cars in operation, an increase of 70 Treadle Installations in twelve months.

There Must Be a Reason. Ask Them.

NATIONAL PNEUMATIC COMPANY

Executive Office, Graybar Building, New York

General Works, Rahway, New Jersey

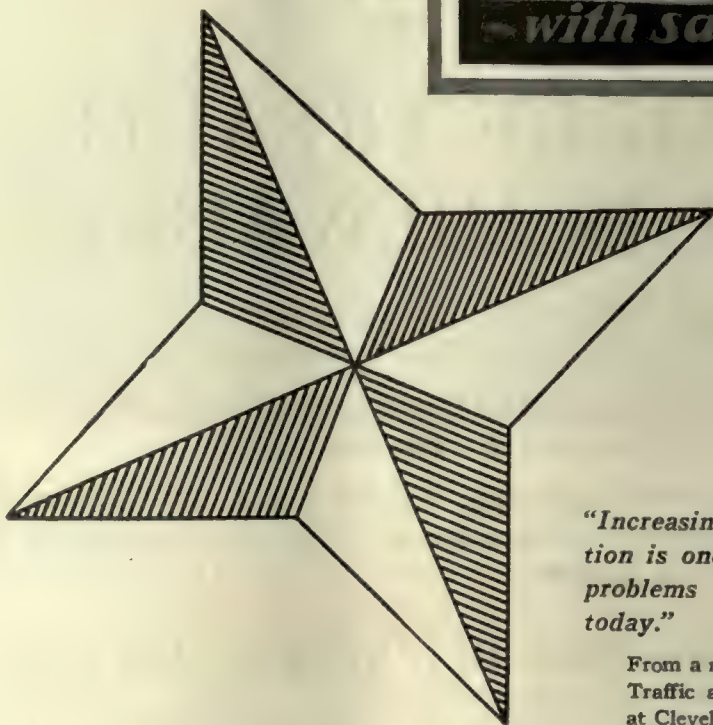
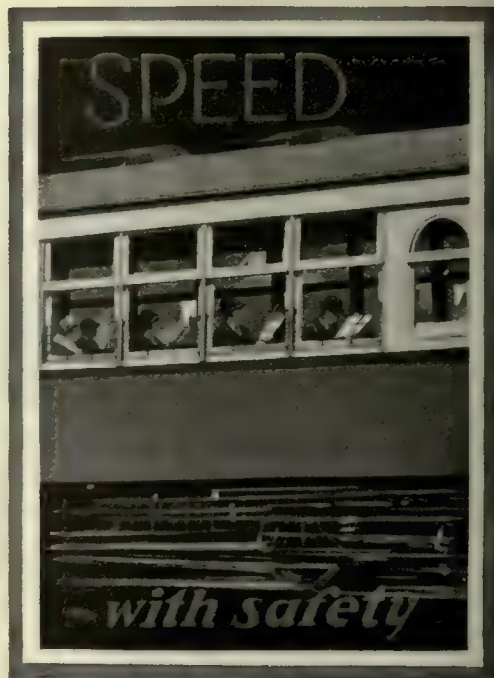
CHICAGO
518 McCormick Building

MANUFACTURED IN TORONTO, CANADA. BY
Railway & Power Engineering Corp., Ltd.

PHILADELPHIA
1010 Colonial Trust Building



Let's take a tip fro



"Increasing the speed of car operation is one of the most important problems before the industry today."

From a report of the discussions of Traffic and Transportation Association at Cleveland.

ur competitors!

It looks as though the automobile people are going to get themselves into trouble with their "speed" advertising.

But the fact remains that it has sold a lot of cars. Life moves at a swift pace these days. People have to get from place to place quickly. They want speed and they'll pay for it.

We, in the electric railway industry, might well take a tip from our competitors.

We could advertise speed without being accused of endangering lives, because we can give speed with SAFETY.

The new Cincinnati Duplex Air and Magnetic Brake, for instance, promises to revolutionize thinking on the subject of SAFE speed in both city and interurban service. Careful independent tests show that it will reduce average emergency stopping distance by 22-5 to 46 percent. To quote from an actual motorman's report made on a Kentucky property, ". . . auto came off ——— Pike into High Street making about 30 miles an hour. The Magnetic Brake saved a serious accident."

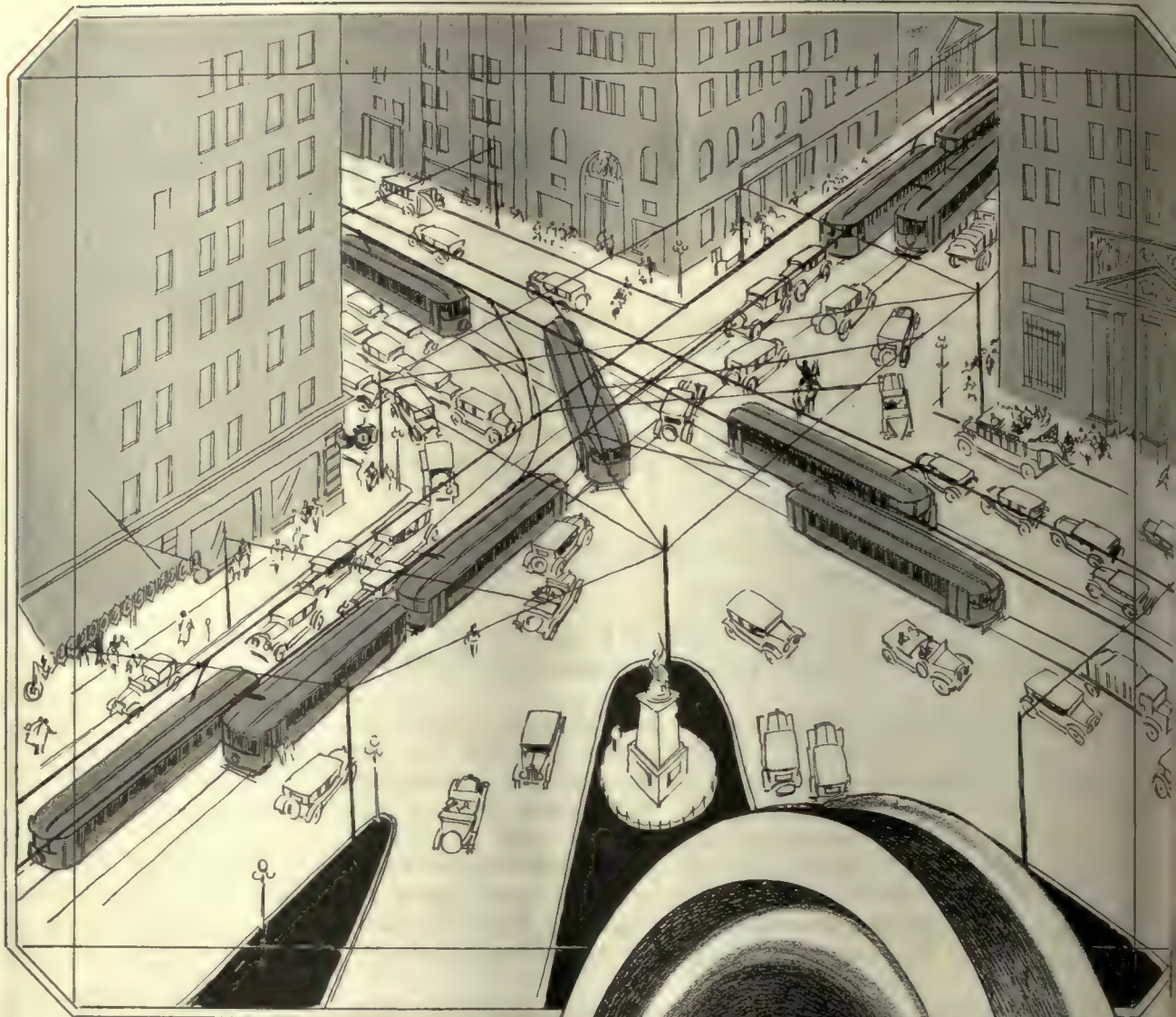
Remember too, that deceleration as much as acceleration helps make for fast schedules. Speed with SAFETY is a mighty strong argument to use against today's competition.

Write us.

CINCINNATI CAR COMPANY
CINCINNATI, OHIO

[The Duplex Air and Magnetic Brake is a feature of the Cincinnati Balanced Lightweight Car]

CINCINNATI **BALANCED
LIGHTWEIGHT** CARS



Year by Year The Congestion Grows

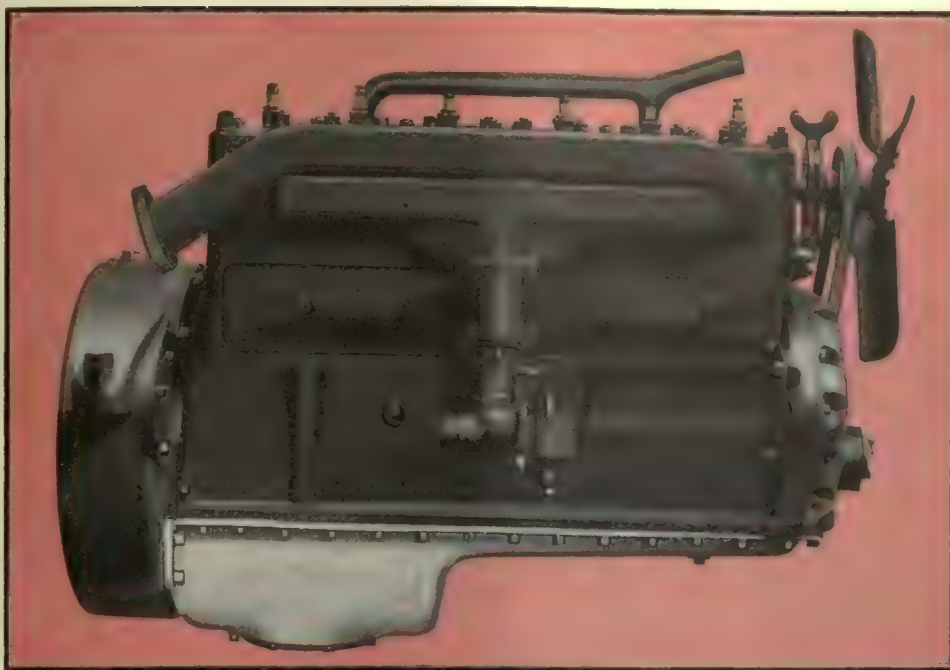
Year by year the country's population clusters more and more about the metropolitan centers. Business sections, crowded before, are beehives of congestion now—and regardless of how rapidly this congestion grows, the street car company is expected to provide adequate transportation facilities.

It is this requirement of 100% service in peak periods that causes the management of street car companies to be so careful of their operating equipment. It is this requirement also that is responsible for the widespread use of Gary Wrought Steel Wheels in electric railway service. A well made, wrought steel product—an iron-clad inspection system—an organization trained in electric railway equipment.

Our wheel engineers are at your command.

Illinois Steel Company

General Offices: 208 South La Salle Street
Chicago, Illinois



a-761-LC

Smaller Heavy Duty Six by Waukesha

For lighter buses of sixteen to twenty passenger capacity, this engine was designed. Two models, now over a year old, have proved adequate to meet horsepower requirements and keep fuel consumption at a minimum. High power and maximum mileage are obtained thru the use of the "Ricardo Head" as on all Waukesha engines. A seven bearing crankshaft of unusually large diameter assures maximum smoothness of operation.

These engines, models 6-KS and 6-KU, follow the latest practice in engine design, having unusually short stroke, "Truncated" cylinders, "Girder" type crankcase and oil "Filtrator." Their bore is respectively 4 and 4 1/4 inches, while the stroke is 4 3/4 on both. The short stroke, large valves and "Ricardo Head" turbulence assure excellent flexibility in bus performance, a combination of good acceleration and top speed. Write for Bulletin No. 628 containing full information.

A79-LC

AUTOMOTIVE EQUIPMENT DIVISION

WAUKESHA MOTOR COMPANY
Waukesha Wisconsin
 Eastern Sales Offices Eight W. 40th Street New York City

Exclusive Builders of Heavy Duty Automotive Type Engines for Over Twenty Years



One of the Goodyear-equipped buses of the Tampa Electric Company, Tampa, Fla.

GOODYEAR

Copyright 1927, by The Goodyear Tire & Rubber Co., Inc.

The Public be Pleased!

Most important factor of all in the growth of any bus service is the public satisfaction with the service.

For out of public satisfaction comes public patronage, assuring the necessary revenue to meet expenses and make a profit.

And of all the elements in bus operation that contribute to public satisfaction, confidence and patronage, none is so essential as uninterrupted service.

The dependable, on schedule service that Goodyear Bus Tires do so much to maintain.

* * *

Goodyear Pneumatic Cord Bus Tires have a fine reputation for reliable, trouble-free, schedule-sustaining performance in motor bus service.

They may cost somewhat more in the first place than tires not so well built, but they more than make up any difference in first cost by what they save in uninterrupted revenue production.

Goodyear Tires are money-making and money-saving tires.

* * *

Goodyear Pneumatic Cord Bus Tires are more durable and more trouble-proof largely because they are made with SUPERTWIST—the new cord material which eliminates shoulder

breaks and other casing troubles.

This patented cord fabric was invented and developed by Goodyear to overcome carcass failures and diminish tire changes.

It is more elastic than ordinary cord fabric. Stretches farther before it breaks. Withstands flexing better and longer before “fabric fatigue” sets in.

* * *

The dependable, long-lived service they give is one reason why Goodyear Tires are used on the buses of the Tampa Electric Company, Tampa, Florida.

“For the past year we have been using Goodyear Tires on our buses operating city service,” writes Manager T. J. Hanlon, Jr.

“The local Goodyear Branch has rendered 100% service; the mileage we have obtained has been beyond our expectations, and tire failures on the road have been reduced to a minimum.”

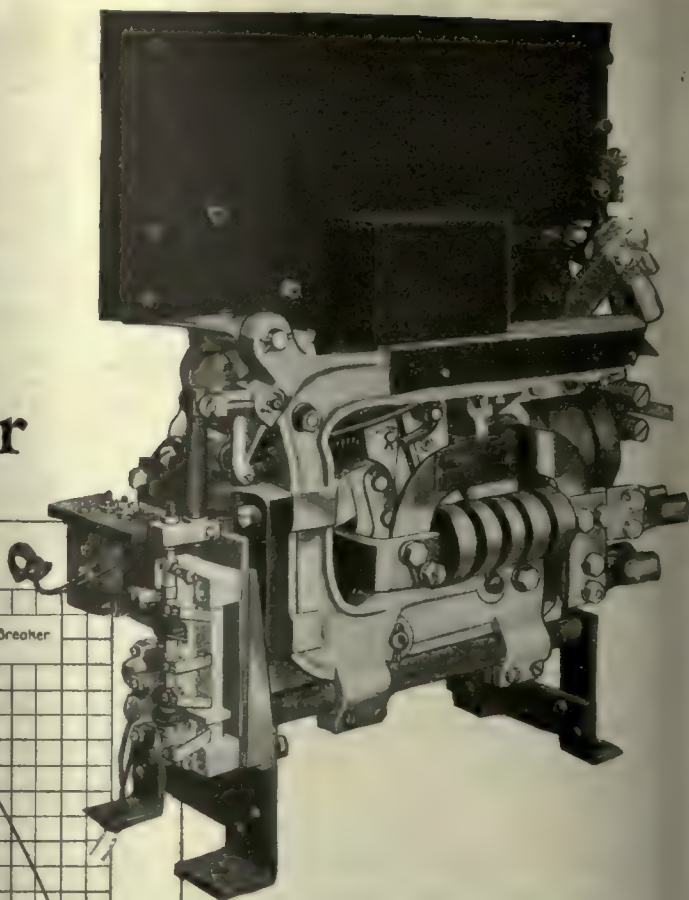
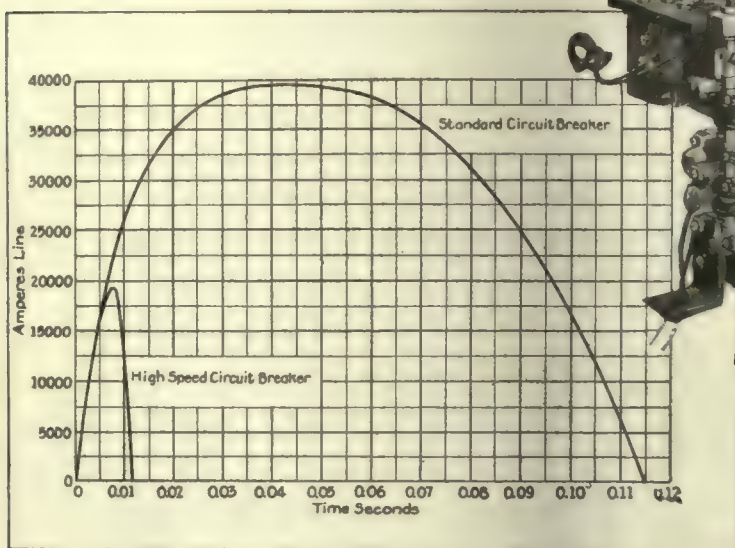
The mileages to which Mr. Hanlon refers include 39,021 miles for one Goodyear Tire, and still-in-service mileages of 26,826 for another; 25,207 for a third; 22,418 for a fourth; 21,667 for a fifth, and so on through a long record of reliable, trouble-free, low-cost Goodyear Tire miles.

For every Goodyear Cord Bus Tire there is an equally fine Goodyear Tube, built especially to the needs of bus service

BUS TIRES

Made with SUPERTWIST

The G-E High-Speed Circuit Breaker



—and the measure
of its greater protection



Even a hasty glance at these two curves impresses one with the extremely high speed and the effectiveness of this breaker for limiting short-circuit currents. G-E high-speed Breakers have been giving ideal protection in hundreds of installations since 1917.

This type of circuit breaker has been uniformly successful in protecting substation apparatus, substation feeders, and electric locomotives. The reduction in current and flashing that results from its use greatly decreases wear of commutator and brushes and practically eliminates damage from internal grounding. It also insures greater reliability and lower substation maintenance.

GENERAL ELECTRIC

Electric Railway Journal

Consolidation of Street Railway Journal and Electric Railway Review
Published by McGraw-Hill Publishing Company, Inc.
CHARLES GORDON, Editor

Volume 70

New York, Saturday, October 29, 1927

Number 18

Why Favor the Minority?

CHECKS made of the customers arriving at prominent department stores in Detroit reveal that of the total 56.7 per cent come by street car, 24.2 by motor bus or trolley and 19.1 per cent by private automobile. This information is contained in the report of a traffic survey by the Detroit Department of Police, abstracted in this issue. Coupled with this finding is the following statement:

"Street cars using the natural highest speed lane and operating on a local stop service become slow-speed vehicles and, in view of the ordinance requiring other vehicles to stop with them, have a very definite retarding action on all other vehicular movements."

With these facts before them, the authors of the report devote practically all their efforts to facilitate movement of the automobiles. Apparently there is no attempt to analyze the situation or to offer suggestions for betterment of conditions so far as the public carriers are concerned, whether street car or bus. True, comment is made on the trial of the "express-trolley, local-bus" system. This is contained in the meager statement, "It is believed that such a combined service would very materially expedite the flow of all types of vehicular traffic on any street where trolley cars are operated."

A representative of the street railway system was on the committee conducting the survey, which may account for the lack of attention to means for facilitating car movements. This, however, seems to be the defect of nearly every traffic survey of the sort made in an effort to expedite movements generally. More consideration should be given to the street car and bus systems, for it cannot be denied that they carry far more passengers into and out of the congested districts than do all the automobiles that can be operated on the streets. Why not put in the forefront of such investigations men who have spent their lives in studying the expeditious movement of traffic, and let them help in the attempt to move the masses more rapidly?

Tell the Man Farthest Down

CONGRESS will meet within a few weeks, so the time is rapidly approaching when the rate of income tax on corporations for the current year and future years will be determined. The responsibility lies upon the shoulders of all of us of grasping this unusual opportunity to end a glaring injustice at Washington. Corporations are paying 13½ per cent of their profits, of the profits of the stockholders, into the federal treasury—more than 2½ times as much as that paid by individuals and partnerships. Why not point out to the stockholders that they are being penalized? Why not send every last one of them on record a reminder of this federal discrimination and urge them to write their Congressmen? These latter gentlemen believe in the power of numbers, for numbers spell votes, so they will pay more attention

to such protests than to those of the allegedly selfish officers of corporations. Tell the stockholders that, no matter what their incomes are, they donate 13½ cents out of every dollar of the earnings of their enterprise to the federal government. Get the small stockholders busy.

Perhaps Congress does not know that upward of 20,000,000 citizens are small stockholders in corporations. A flow of letters into the offices of members from these investors will soon impress them with the importance of tax revision for the stockholders of corporations. These investors should remind their Congressmen, too, that a healthy revision of corporation income taxes will bring many more individuals into the class of income taxpayers, a social advantage the desirability of which will be seen when it is realized that out of our immense population, in excess of 100,000,000 people, only 4,171,051 filed returns for 1925 and only 2,501,166 of these were found taxable.

Tell the story to the man farthest down—he's the stockholder and the taxpayer! And get him to tell his story to his Congressman before the session opens in December.

Planning for the Future

UNLIKE many enterprises, transportation is characterized by its permanence. It is pre-eminently a long-term business. Communities expand along with the transportation service that is furnished. Since the future of the entire scheme of community growth is so intimately tied up with its transportation it naturally follows that there must be a stability to that service. Otherwise the members of the community will not be satisfied to make permanent investments of their own in factories, stores or offices, and homes.

So it is necessary for the electric railway executive to take a long-distance view of his business. Capital expenditures must be made over a period of years, and provision must be made year by year to carry the charges and to amortize the principal, or else to arrange for refunding at the end of the term. Even where franchises are granted for specific periods they are for from 20 to 50 years. This indicates that there must be set up a budget of earnings and expenditures if any plan is to be made for producing the necessary income. Unless this is done capital cannot be attracted.

This long-term viewpoint was urged by several of the speakers at the recent Cleveland convention, particularly George E. Frazer, who advocated making budgets in terms of five to ten years instead of for a short period where results can be predicted more closely. Long-term estimates of this kind necessitate an intensive study of the revenue-producing qualities of the property's assets. If there are portions of the plant that the budget shows the company cannot properly finance and develop, then the budget will suggest the sale of these assets. The budget also should show whether or not other portions of the property are being used to greatest productivity, and

should suggest ways to improve situations that are not entirely satisfactory.

By making estimates of this sort it is possible to give the prospective investor a truer picture of what the future holds for the transportation property. Accordingly it is easier to interest him in the securities if the set-up is such as to inspire confidence in the management and its ability to carry out the plan as laid down.

Consistency—A Gem in Advertising Business

TO ADVERTISE electric railway rides, while a preposterous idea a generation ago, is now a necessary concomitant of successful operation. The street railway or, indeed, any utility is doomed to die unless through at least one of the sundry media it has reached the man in the street. In one year, according to statistics, public utilities spent approximately \$25,000,000 for advertising, of which 63 per cent was used for space in the daily newspapers. Other methods are becoming popular now, for instance the movie, with its unusual opportunity for enlightening while the same time entertaining, and the radio, which will transmit to the listener a true story of the railway's place in the transportation world.

True it is that the use of any amount of newspaper advertising will not direct attention away from the untidy and discourteous conductor, the ramshackle, paintless car and the surly management. Few properties have failed to learn that correction of such matters is an essential of service. Now it is a matter of what can be accomplished with an appreciable amount of properly placed advertising and with the well-trained, well-educated employee and brightly decorated cars and coaches operating as personal salesmen. It is not a debatable point any longer. Advertising sells rides. A well-planned merchandising campaign undertaken by any railway management will cost money, but carried on consistently and courageously over a period of years, even if some of the years be lean, will bring satisfying results, provided, of course, the promise in the advertisements is fulfilled in a service that not only satisfies but also stimulates. Then the result is good will, than which there is no better yield.

Forward Steps in Traffic Regulation

OUTSTANDING in the directed efforts to solve the traffic problem, which was discussed at length in several meetings at the recent Cleveland convention, are the extensive surveys made in some of the larger cities, such as San Francisco, Detroit, Los Angeles and Newark. Street railways co-operating with civic and industrial bodies have contributed in certain of these instances in gathering traffic data and finding means for more efficient use of streets. A general feeling of good will has characterized their participation. Several suggested plans for relief included in the reports have been adopted, or at least given a trial, with satisfactory results. In Detroit the express-trolley, local-bus system, a traffic relief measure advised, is being given a trial on one of the principal lines. Another example of specific action taken is the adoption in Los Angeles of the loading-zone rule, a regulation which has proved effective in eliminating double-line standing of automobiles.

In almost every survey it was discovered that stops due to traffic signals and officers were the chief cause of car delays. Properly designed systems of co-ordinated control are the results of study on this subject. Chicago, Cleveland and Los Angeles have proved the worth of

these properly timed devices, which are now being adjusted in other cities.

Another cause of delay and general vehicular obstruction is loading. The use of loading platforms and zone employing the pay-as-you leave collection system on cars outbound in the congested district, installing double entrance doors and educating the public to board quickly have all helped to speed up loading. Numerous innovations of parking regulations have also caused much trouble and interference with street car and general vehicular movements. Reports of the many violations have prompted cities to enforce more strictly the existing ordinances.

A big step in reducing car delays has been the modernization of equipment, permitting better acceleration and braking. Several companies in the past year have purchased new rolling stock or have rehabilitated their present equipment. Lighter cars, better powered, are certain to improve traffic flow.

The Hoover Conference recommendations on motor vehicle operation have proved invaluable. The interest shown by the government in solving the great traffic problem of the nation is itself significant of the importance of the situation.

Is Scottish Frugality a Myth?

BRITISH tramway properties follow the commendable practice of publishing in their annual reports extended statistics of operation, among which many of the properties include a tabulated list of the articles turned in to their lost and found departments. These lists are not greatly different from those which might be compiled for American railways, but when published for an entire system they show some surprising details as well as totals.

For instance, the figures in the last annual report of the tramways of Aberdeen, Scotland, rather destroy the legend that the Scotch are supercareful in the attention which they give to their property, or at least that it is so when they travel on the street cars. The lost property returns from Aberdeen also show—at least on the surface—a great and unexplainable difference in forgetfulness between Scottish ladies and the men in that northern country. Otherwise, why should the lost and found department in Aberdeen report the amazing total of 583 ladies' umbrellas left in the cars during the year as compared with only fifteen umbrellas belonging to the sterner sex? Of course, it would be improper to assume that the forgetful person with the lady's umbrella always belonged to the fair sex. Husbands have been known to borrow their wives' umbrellas and leave them on street cars. But there could not have been very many instances of this kind, because practically the same ratio applied to gloves left on cars in Aberdeen. No man was ever known to borrow his wife's gloves, but the statistics from the city show that there were only 41 gentlemen's gloves abandoned on the corporation's cars and buses during the year, whereas the number of ladies' gloves left during the same period amounted to the amazing total of 1,019.

Not only in these figures but in others farther along in the list the men come off triumphant in this test of comparative absentmindedness. To quote only one instance: During the year only 38 pipes and 52 tobacco pouches were left in Aberdeen cars. The owners of these articles almost certainly must have been men, because while ladies may like cigarettes they are not addicted to the pipe.

There are other notable items in the list of lost and found articles on the Aberdeen cars. They include

milk cans, 34 boots and shoes, the same number of spectacles, a go-cart and a violin case. But if these records create a surprise, what shall be said of the statement that 135 bibles and hymn books were also abandoned? Were these forgotten through the abstraction of their owners in wildly thought, or because they became engaged with some fellow passenger in one of those theological discussions for which Scotland at one time was—and still is—famous?

These records again emphasize that, after all, the street cars in Aberdeen as well as elsewhere are simply microcosms—miniatures of the world at large. The lost and found department record in Aberdeen, like that in any American city, is but a reflection of human nature, which is much the same everywhere.

High-Pressure Community Development Brings Transportation Difficulties

COMMODITY selling by high-pressure methods is no longer in great favor among progressive manufacturers. Not so long ago it was common practice for the manufacturer to go after every available market without considering the ultimate suitability of his product to the need of the consumer. Sales and still more sales was the slogan. Today the most successful selling campaigns are directed first to finding the market's needs and then producing the kind of products that meet those needs.

Real estate development companies might well adopt the philosophy which experience has taught the manufacturers. Many of the realtors, as they like to be called, are engaged in high-pressure development schemes started without consideration of their ultimate effect on the community. Greater and ever greater population is their objective. Of course there is nothing inherently harmful or wrong in population increase. For best result, however, it should be obtained in a natural and orderly way rather than by aggressive campaigns to sell land.

The difficulties that follow from an extremely rapid increase in population are well illustrated by the recent experience of the Long Island Railroad. Within a generation the western end of Long Island has been changed from a rural district to a densely populated suburban community. To some extent this change has been natural and inevitable. To a large extent, however, it has been the result of deliberate efforts to attract more and more people to live there. So successful have been these efforts that the Long Island Railroad now carries almost 100,000 passengers a day into and out of its New York station. The commuters complain that the railroad fails to provide them with adequate facilities. The management asserts that its facilities were designed with a view to run-line operation and that the congestion is caused by the tremendous number of short-haul riders, who should be cared for by the New York City rapid transit system. To anyone who considers this problem with care it is obvious that the railroad cannot afford to provide accommodations of trunk-line quality for passengers who ride only a few miles and pay only a few cents fare.

Under existing conditions the long-haul passengers have to suffer on account of the short riders. The real estate developers, however, ignore this fact entirely. They are clamoring for more service to accommodate more people and, of course, to sell more land. The solution of the problem does not lie in this direction. The proper development of Long Island should not be hampered by lack of adequate transportation facilities, but they will not be secured there or anywhere else by

fencing between the local interests and the railway. What is needed is less bickering and a greater desire to understand each other's needs and point of view.

Chicago Tackles Its Settlement Problem Again

STEP by step Chicago is getting around again to the consideration of its transit problem. The latest move is presentation of the tentative draft of a new indeterminate permit bill to the sub-committee of the Council on local transportation. This same committee had previously approved the bills dealing with the subjects of subway construction, consolidation, a local transit commission and repeal of the twenty-year limit on electric railway franchises. It was to be expected that the voice of the objector would be heard, and it has been raised, particularly in criticism of the indeterminate franchise plan. This is the feature regarded by the companies as most vital of all to the solution of the problem. Mr. Lisman has renewed his offer in modified form, and the advocates of municipal ownership, with Carl D. Thompson, secretary of the Public Ownership League of America, as their most recent spokesman, have raised their voices in opposition to the acceptance of the plan favored by executives of the surface and elevated lines for fear that it would absolutely preclude any chance of the city to own its local transportation system.

These are merely some of the angles. A final meeting of the sub-committee to approve and recommend the entire set of bills to the full committee on transportation will be held on Nov. 2. To attempt to comment constructively on the measures in anticipation of that meeting would be foolish. To attempt to prognosticate the course the matter will now take would be to speculate about intangibles. The thing that is significant just now is that the matter has again become one of public discussion. It is to Chicago's interest as much as it is to that of the companies that the matter be settled, settled quickly and adequately. It will do no good to castigate the city for its indifference of the past. It is to be hoped that good plans, carefully matured, will meet a better fate than did the bills advanced last year.

Co-ordinated Service Ahead in Indianapolis

CITIZENS of Indianapolis may well be pleased with the prospect of the Indianapolis Street Railway taking over the Peoples Motor Coach Company under a plan that contemplates co-ordination of the two services. This is as it should be. It was a long controversy this, culminating in an appeal by the railway to the Public Service Commission to approve the purchase deal. With that proposal the commission found fault on the score of the price to be paid for the bus carrier and on the matter of the ability of the railway to finance the purchase on terms not onerous to itself. With these strictures the court did not agree.

There is no need to go into that matter here, except to emphasize that the decision stands out as the first one of its kind under the recent law which gave carriers the right to appeal to the courts from decisions of the state regulatory body. There was a real chance for honest difference of opinion over the issues involved in this case. The important point now is not that there never should have been two systems of public passenger service in Indianapolis, but that the city is at last to enjoy co-ordination under conditions that augur well for satisfactory performance by each type of transport operated intensively in the field for which it is best suited.

Two Transit Reports

Presented in New York

WITHIN the past few weeks two notable reports on the New York transit situation have been published. The first is the report of Samuel Untermyer to the Transit Commission reviewing the series of hearings that have been going on for a period of several months before the commission. The second is the report of Major C. E. Smith to City Comptroller Charles W. Berry, answering two specific questions asked him by that official. This latter report was made public on Oct. 24, although preliminary copies were reviewed by several New York daily newspapers previously. The two reports contain so much vital information, and differ so much in their interpretation of the transit problem, that some knowledge of them is essential to an understanding of the situation.

Some of the salient points of the Untermyer report were reviewed in this paper, issue of Oct. 1, page 606, and a still briefer outline of the preliminary draft of the Smith report was given in the issue of Oct. 8, page 717.

Recommendations of Samuel Untermyer, special counsel to the New York Transit Commission, and C. E. Smith, consulting engineer to the City Comptroller, differ widely. The former desires recapture of existing lines for operation at 5 cents, while the latter proposes unification at a fare to cover the cost of service

Samuel Untermyer, special counsel of the Transit Commission, at the request of that body summarized and reviewed the most material features of the testimony taken before the commission in its studies and investigations leading to a plan of readjustment for the relief of the emergency which has been declared to exist, and for the improvement of service in New York City. Mr. Untermyer's findings are published in a 135-page report with many additional exhibits. Much of the report is devoted to quotations from the testimony of operating officials.

The plan submitted in this report is based primarily on recapture of city-built rapid transit lines with the purchase or condemnation of such portions of the privately built systems as are considered necessary to the formation of an independent municipally owned system, with a revision of the city debt limit to make possible the issue of the necessary securities. The following digest, which gives the high spots only, indicates the procedure recommended for making this possible.

The Untermyer Report

THE city immediately shall terminate all leases of its subways to the New York Rapid Transit Company, subsidiary of the Brooklyn-Manhattan Transit Corporation, and to the Interborough Rapid Transit Company and pay the recapture prices. The city shall buy all the property and assets of the I.R.T., including the Manhattan Railway Company's elevated system, and subways owned by the former company. The city shall form a rapid transit system of these subway and elevated lines.

A corporation shall be formed under the direction of the Transit Commission to lease and operate the rapid transit system thus formed. This corporation shall have a nominal share capital and shall have power to issue securities, to form subsidiary companies if needed and to appoint officers necessary to carrying on its operations. This corporation shall be named "The Board of Transit Control."

The board of directors of the corporation shall consist of nine members, appointed as follows:

Chairman of Board of Transportation of New York City.

Comptroller of the city of New York.

Nominee of the Mayor of New York.

Nominee of Real Estate Board of New York.

Nominee of Merchants Association of New York.

Nominee of Brooklyn Chamber of Commerce.

Nominee of Queensboro Chamber of Commerce.

Nominee of Bronx Board of Trade and Bronx Chamber of Commerce.

The ninth director shall be elected by the first eight selected and shall be president of the corporation.

The Mayor of New York is a member of the board of directors ex officio.

Terms of years of tenure of office of the directors are staggered. The directors serve without compensation, but a nominal sum (\$450) is suggested which will be apportioned

among those present at board meetings or meetings of the executive committee (\$250). No one holding public office is eligible to the board of directors with the exception of the city officials noted.

The board of directors appoints: One or more vice-presidents; a treasurer and assistant treasurers; a comptroller; a general counsel and assistants; a general manager and assistants; a secretary and assistants; a purchasing agent and assistants; such other officials as may be needed.

All contracts and purchases of material and supplies in excess of \$1,000 shall be awarded on the basis of competitive bids in conformity to specifications.

The lease shall be 25 years and for renewal terms as may be agreed upon.

The lines shall be operated on a 5-cent fare basis until otherwise required by law.

Gross revenues of the corporation shall be applied as follows: (a) Operating expenses, including overhead charges; (b) maintenance of the properties; (c) fixed charges on underlying liens of property taken over; (d) payment of interest and sinking fund upon the total investment of the city in the leasehold properties; (e) the construction of additional subways and betterments and extensions of existing subways.

If the net revenues are insufficient to meet all the above requirements the city shall make good the deficiency. But on new property expenditures of \$100,000 or more the corporation must get authority from the Board of Estimate and Apportionment of the city of New York. A referendum of the people shall be had to vote on their agreement to meet with general taxation returns any deficits that may arise by reason of the 5-cent fare.

The Board of Transit Control shall be under the supervision of the Transit Commission.

It is recommended that the constitutional amendment to

and New York City \$300,000,000 be passed and the money be used to recapture and purchase the rapid transit lines included in this plan.

I.R.T. SUBWAY PROPERTIES INCLUDED

Under Contracts No. 1 and No. 2 between the city and the I.R.T. cover subways built prior to 1913. These include lines in Atlantic Avenue along Flatbush Avenue and Fulton Street to Bowling Green and from South Ferry north to Grand Central, west to Times Square on 42nd Street and thence north on Broadway to 96th Street. Two lines north of 96th Street are included, one going to Broadway and 242nd Street (in Cortlandt Park) and the other to Bronx Park and 181st Street.

The lease under which these properties are operated by the I.R.T. has no recapture clause but the properties revert to the city upon expiration of the contracts in 1967. The I.R.T. pays the city an annual rental of \$2,655,569 for the year ending June 30, 1927, and this sum meets security and sinking fund requirements of the sums invested by the city in these subways. Immediate termination of these contracts and the incorporation of these lines in the city rapid transit system are recommended.

Under terms of Contract No. 3 between the city and the I.R.T. additional subways were constructed. These include: Seventh Avenue line from Times Square to Chambers Street and branches to South Ferry and Borough Hall, Brooklyn, respectively; Lexington Avenue line from Grand Central to 131st Street, Bronx, and two branches, one to Jerome Avenue to Woodlawn Road and the other along Southern Boulevard to Pelham Bay Park; the Eastern Parkway line; the Queensboro subway; the White Plains Road line. The contract with the I.R.T. for these subways contains a recapture clause and immediate recapture and the inclusion of these lines in the city rapid transit system is urged. The cost of recapture of the East Side line only on Jan. 1, 1929, is given as \$14,000,000.

Mr. Untermyer advocates the purchase of the entire I.R.T. subway properties and of the Manhattan Elevated Railway Company properties for a total sum of \$245,594,000 in the form of 38 and 50-year 3 to 3½ per cent city bonds.

THE B.-M.T. PROPERTIES

Contract No. 4 between the city and the N.Y.R.T.Co. (B.-M.T.) covers practically all the subway properties of the B.-M.T. system. This contract contains a recapture clause and Mr. Untermyer recommends the city take over the B.-M.T. subways and incorporate these properties into the city rapid transit system. The recapture price given in the report is \$62,000,000 as of Dec. 31, 1928. The report continues:

It is estimated that it would cost, at 1926 construction prices, at least \$347,180,000 to reproduce the recapturable city subways and equipment of the B.-M.T. system in which the city has an investment as of June 30, 1926, with accumulated unpaid interest and sinking fund charges of \$209,333,000, all which the city can recapture as of 1927 for \$50,774,000. The B.-M.T. is drawing practically its net profits from this property, while the city is getting nothing and has no immediate hope of realizing anything by way of return on its investment so long as the present condition continues.

WHY SURFACE LINES SHOULD NOT BE INCLUDED IN THE PLAN

Mr. Untermyer believes that the surface lines should not be included in the plan for the following reasons:

1. They are losing money, not even earning their fixed charges.

2. It would involve the impossible task of negotiating with each of 43 companies included in the seventeen operating systems, with separate forms of outstanding securities.

3. Many of the companies have fixed assets with no corresponding earnings; many are not earning their fixed charges; others are barely meeting operating expenses; while still others are operating at a steadily increasing loss. Thousands of various classes of security holders would have to be consulted and their consent secured.

4. Taken in their entirety they are not earning within \$465,792 of their fixed charges for the year ended June 30, 1927, and their funded debt exceeds the value on an original cost basis of their physical assets by \$60,295,000.

5. Inclusion of the surface car lines is not necessary to or an integral part of the plan. Their inclusion in any plan would inevitably spell the deathknell of the 5-cent fare, and unnecessarily so. If that were its deliberate purpose it could not be more effectively accomplished.

Although the surface car lines carry 35.3 per cent of the total city passengers, the growth and development of the city involves only the unification of the rapid transit lines, the extension of the transit facilities on them into the new sections of the city and the increase of rapid transit facilities to ameliorate the present intolerable congestion and service.

The continued operation of the surface lines is, at least for the present, essential to take care of the short hauls and as feeders to the rapid transit lines, except to the extent they may be replaced by buses and subway extensions. There is, however, no reason why the city should assume the burden of their increasing difficulties of operation due to traffic congestion and other causes, if it were financially able to do so, which it is not, or why it should take over the burdens of the steadily increasing losses, nor the uncertain risks of further losses from new competition from buses and additional subways. This is precisely the psychological moment not to take over the surface car lines, when we do not know and have no means of estimating the effect of bus operation. If it should hereafter be found desirable to include the surface lines in a more comprehensive plan and their owners can agree on a reasonable price, there is no reason why that proposition should not receive independent consideration on its merits. It is not practicable at this time.

The elevated roads are equally essential to the rapid transit system of the city. Of the 1,807,000,000 passengers carried by the rapid transit lines, the elevated lines carried 628,000,000 in 1927. The city cannot do without these facilities at this time nor until more subways are built to take their place.

OPERATING STATISTICS

In his report Mr. Untermyer gives many detailed statistics regarding the properties. The following have been selected as showing the magnitude of the proposition and the relative sizes of the various elements involved:

TOTAL ROUTE MILEAGE, JUNE 30, 1926

Subway	.....	116
Elevated	.....	96
Surface	.....	516
		728

AUTHORIZED AND CONTEMPLATED MILEAGE

Subways	.....	63
Total	.....	791

REVENUE PASSENGERS, BASED ON FARES AS OF JAN. 30, 1925, 1926, 1927

	1925	1926	1927
Subways	1,074,000,000	1,147,000,000	1,202,000,000
Elevated	607,000,000	605,000,000	628,000,000
Surface	1,013,000,000	997,000,000	1,001,000,000
Total	2,694,000,000	2,749,000,000	2,831,000,000

VALUATION ON ORIGINAL COST BASIS, JUNE 30, 1926

Subways	.....	\$560,000,000
Elevated	.....	180,000,000
New City Subway (est.)	.....	643,645,000

Total \$1,384,422,000

VALUATION ON REPRODUCTION LESS DEPRECIATION BASIS

Subways	.....	\$943,440,000
Elevated	.....	221,155,000
New City Subway	.....	643,645,000

Total \$1,808,240,000

BOOK VALUE AS OF JUNE 30, 1926, BEFORE DEPRECIATION

Subways	.....	\$574,127,000
Elevated	.....	253,662,000

Total \$827,799,000

VALUE OF SURFACE CAR LINES

Original cost basis	.....	\$131,857,000
Reproduction cost basis	.....	188,161,000
Book value	.....	252,557,000

FUNDED DEBT, JUNE 30, 1927

I.R.T.	.....	\$209,000,000
Manhattan Railway	.....	105,206,000
City Contracts 1 and 2	.....	57,092,000
N.Y.R.T. Corp.	.....	114,132,000
City Contracts 3 and 4 and balances on Contracts 1 and 2	.....	254,015,000
City Contract (New Subway)	.....	69,503,000
Total rapid transit	.....	\$809,870,000
Surface car lines	.....	204,592,000

GROSS INCOME			
	1926	1927	
Rapid Transit	\$34,048,000	\$34,153,000	
Surface Car Lines	7,851,000	7,581,000	
NET EARNINGS AND LOSSES—ALL PROPERTIES			
	1925	1926	1927
I.R.T., Subways ...	\$4,188,000	\$6,395,000	\$6,289,000
I.R.T., Manhattan Div.	4,534,000D	4,126,000D	4,909,000D
N.Y.R.T. Corp.	3,861,000	4,684,000	5,484,000
Total Rapid Transit	\$3,515,000	\$6,953,000	\$6,864,000
City, approximate ...	10,500,000D	11,100,000D	13,600,000D
Total Rapid Transit	\$6,985,000D	\$4,147,000D	\$6,663,000D
Surface Lines	2,066,000D	2,072,000D	2,466,000D
Total on transit system	\$9,051,000D	\$6,219,000D	\$9,102,000D

D indicates loss or deficit.

Text of Statute—P.S.C. Sec. 106

THE procedure recommended by Mr. Untermeyer is based on the statute known as the Public Service Commission law, section 106. Since some knowledge of the statute is essential to an understanding of the situation, the principal points included in it are given very briefly below.

The Transit Commission after making the necessary studies and investigation shall prepare a plan of readjustment for the relief of the emergency which is hereby declared to exist, and for the improvement of transit in such city. Such a plan shall contain provisions which in the judgment of the commission will accomplish as nearly as may be the following purposes: (1) The combination, rehabilitation, improvement and extension of existing railroads so that service thereon may be increased and improved to the fullest extent possible; (2) the receipt as soon as practicable by the city of sufficient returns from the operation of the railroads so that the corporate stock or bonds issued by the city for the construction of rapid transit railroads may be exempt in computing the debt-incurring power of the city and (3) the assuring to the people of the city the continued operation of the railroads at the present or lowest possible fares consistent with the just valuations of the railroads and their safe and economical operation. . . . It shall consider the incorporation in the plan of provisions whereby the title to such railroads as are not

already owned by the city and whose ownership thereby is deemed by the commission to be desirable may be vested in the city for return for a lease of such railroads by the city. . . . The commission shall cause a valuation to be made of the property, other than franchise or going value, necessarily used in public service of the railroads included in the plan. . . . The commission shall consider the incorporation in the contracts to be entered into to carry such plan into effect of provision for a board of control to have supervision and control over the management and operation of the railroads included in the plan . . . to be known and designated as the Board of Transit Control, with authority to issue securities, etc. . . .

Simultaneously with the above, Major C. E. Smith, consulting engineer, St. Louis, conducted a study of two problems on the transit situation for City Comptroller C. W. Berry of New York City. The two problems submitted were:

QUESTIONS ASKED BY COMPTROLLER BERRY

1. What can be done with the old subway lines plus the possible utilization of such parts of the new construction as may be available to afford transit relief to the traveling public while the entire system is being completed?

Such relief to be either temporary or permanent or a combination of both. Correction of present conditions in the shortest possible time being the principal factor.

2. Is the plan that has been proposed and presented to the new administration the best one for the entire city? Will the proposed system upon completion provide, as far as our transit experience and available expert engineering knowledge can make humanly possible, the maximum in the way of modern rapid transit facilities for our ever-expanding municipality?

How is this great undertaking to be paid for?

How is the system to be operated, and by whom, when it is completed?

The answers to these questions, together with three brief appendices, form a 95-page volume as submitted by Comptroller Berry. Only the principal points are included in the digest which follows:

The Smith Report

ALL New York transit systems should be merged and all operated as a single unified system by the present rapid transit companies, the latter to be merged eventually into a single company. This transit system should be made self-supporting, partly by fares which should fluctuate up and down with variations in the cost of service and partly by a tax on the special benefits to particular property resulting from rapid transit construction and not subsidized by the general taxpayer. Better service can be provided with higher fares, and ample subways can be provided for comfortable transit at a reasonable fare.

Elevated and surface lines are not obsolete nor inherently losing ventures. Their lack of profits is due to the competition of the city-owned subsidized subways. The old elevated railways must be tolerated until a great deal more money is available and, in the meantime, their revenues should permit them to give good service.

Motor buses to handle all surface traffic would number more than fifteen times the Fifth Avenue buses at an increased cost of many millions of dollars in fares and would introduce serious traffic congestion.

Recapture of city-owned rapid transit lines would present complicated legal, operating and financial problems, and either disrupt present routes and require more fares to be paid or possibly increase fares on the company lines. The recaptured lines would only handle 25 per cent of the present rapid transit traffic. The independent city system of subways now under construction is much more expensive than necessary to give transit relief.

PRIVATE OPERATION DEEMED BEST

The best results for New York transportation will be secured by private operation, state regulation of service, methods and practices and city control over constitution,

franchises, contracts and general policy. In every transportation system there are so-called "cream" lines that yield the profits which support the so-called "lean" lines. Yet the latter are very necessary. It would not be an accomplishment to separate the lines in order to secure a system of profitable lines if by so doing the "lean" lines would have greater difficulty in giving satisfactory service.

The subways are so congested that the companies do not now need any increase in fares so long as the people accept the present quality of service and the city makes the taxpayers pay the fixed charges on the city's investment. The cost of a ride on the subways is 5 cents, plus the city's tax exemption plus the carrying charges on the city's investment. If the subways had paid the same amount of taxes per passenger as the Manhattan Elevated Railway and also the city's carrying charges, the fare on the I.R.T. subways for nine years, 1919-1927, inclusive, would have averaged 6.143 cents. This average fare on the Manhattan Elevated and the surface lines will secure improved service and relieve the companies from unfair financial troubles.

PROPOSED PLAN OF JOINT OPERATION

The best solution of the transit problem is by an agreement between the two operating companies and the city that the present lines will be operated as one in the interests of the best service to the public, the earnings pooled, the fares fixed to meet the entire cost of service, including the city's interest and sinking fund charges, and new subways to be merged into the present system, the plans changed so as to provide for the necessary additions to form a comprehensive system instead of the proposed competitive system now under way.

No other charges would be necessary—no financial mergers, no swapping of securities, no issue of city bonds

for recapture or purchase, except for the purpose of reducing the annual charges. Each company would operate its own lines and jointly operate new lines or reach agreements as to their operation. There is no doubt that before many years one company would be dominant in control, a consummation devoutly to be wished.

Changes in the dual contracts are proposed as follows: A portion of the N.Y.R.T. (B.-M.T.) return of \$3,500,000 per year and an additional amount if necessary to be agreed to as payment for the amortization of the "existing railroads" at an agreed valuation.

A portion of the I.R.T. return of \$6,335,000 per year and an additional amount if necessary to be agreed to as payment for the amortization of the "existing railroads" (Contract No. 1 and No. 2 subways) at an agreed valuation.

The 7 per cent on \$60,000,000 stocks and Manhattan Elevated preferential of \$1,589,348 to be replaced by 5 per cent on \$60,000,000 and an agreed annual charge for the amortization of the Manhattan Elevated system at an agreed valuation.

Each surface line or other company taken in to receive an agreed annual payment for return and amortization of its property at an agreed valuation.

In exchange for assurance of return and amortization payments each company to vest title to its property and franchises in the city at the execution of the contract, complete ownership to pass on completion of amortization.

The city's return under Contract No. 3 to be reduced from 8.76 per cent to its actual interest and sinking fund charges, the same as in Contract No. 4.

The accumulated deficits of the city under Contracts No. 3 and No. 4 and of the Manhattan Elevated under the certificates to be canceled. The accumulated deficits of the I.R.T. and N.Y.R.T. to be funded and amortized within a reasonable period of time.

All net revenues of the companies to be pooled and used to pay all company and city charges. All surplus to go into a surplus fund under the control of city and company.

Rapid transit lines of each company to be open free to passengers of other companies to all intersecting points.

Such transfer charges to be made between rapid transit lines and feeder surface and bus lines as determined from time to time.

A fare of 7 cents cash, four rides for 25 cents to be effective on execution of contract by each company.

Fares to be raised or lowered from time to time according to the state of the surplus fund.

Instead of 50-50 division of net profits as heretofore, the total operating cost per car-mile to be allowed in advance each year and after adjustments for unforeseen changes in price and wage levels, the companies' efficiency in keeping operating costs below the allowance to be rewarded about as follows: One-third to surplus fund, one-third to company, one-third to operating personnel.

Provision that future construction and equipment be paid for by the city or company as agreed in each case.

Provision that city bonds may be exchanged for company securities under appropriate conditions.

The Transit Commission to be continued for the regulation of service and practices of the company.

The chairman of the Transit Commission, the City Comptroller and an appointee of the company to constitute a board of control to fix fares, operating allowances, busses and certain other questions, the companies and the city to have the right to request arbitration of disputed questions.

The City Comptroller to organize a transit accounting office to check and supervise cost of service and to assist him in exercising his jurisdiction under the contract.

City and companies to secure enabling legislation for constitutional amendment to prevent amendment of contracts by a statutory body.

The city to have the right to issue bonds and pay the companies the amounts required under recapture provisions of the dual contracts.

The city to have the privilege of carrying all or any part of fixed charges by taxes on the increase in property values due to transit.

The city and the commission to appoint a conference committee to work out amendments to the contracts as outlined above and to negotiate with the companies.

DUAL CONTRACTS NOS. 3 AND 4

Contracts Nos. 3 and 4 with the city, under which the I.R.T. and B.-M.T. subways are operated, were prepared carefully in the city's interest. They attracted a large amount of private capital in 1913 and since at more favorable rates than any other capital has been obtained for public utilities in the United States. The first money invested in the subways built under these contracts earns 6 per cent for the companies and, allowing $\frac{1}{2}$ per cent for amortization during the life of the contract, the net return is $5\frac{1}{2}$ per cent. On money for additions the companies get actual interest plus 1 per cent for amortization until paid for, when the additions belong to the city, thus giving a net of about $5\frac{1}{2}$ per cent. This compares with an average of about 6 per cent on \$400,000,000 in the money invested in transit systems in five other American cities.

The only criticism of the dual contracts worthy of serious consideration relates to the fixed preferentials of the original or then (1913) "existing" railroads, \$6,335,000 per year to the I.R.T. in place of the earnings on the original subway, and \$3,500,000 to the N.Y.R.T. in place of the net earnings on the former Brooklyn elevated and rapid transit lines. These were calculated as the average net earnings of the respective companies for 1910 and 1911. In agreeing to accept the preferentials, the companies gave up prospects of large amounts of money. These earnings were necessary to support the new subways during the development of new traffic.

It is the opinion of Mr. Smith that the rate of return on a fair value of the properties would exceed the returns to which the companies are entitled under Contracts No. 3 and No. 4 and that their property is held under these contracts on a very favorable basis to the public. It seems clear that if the rule of reasonable returns on a fair value be applied to these properties, the financial returns to the companies would be greater than those which are provided in the contracts.

ELEVATED SYSTEMS NOT LOSING TRAFFIC

Contrary to general impressions, business is not leaving the elevated railways in favor of the subways. The rate of increase has not been so fast as that of subway traffic, but it must be remembered that the elevated lines were thought to be saturated when the subways were started. In 1912 the elevated lines carried 304,270,841 passengers, in 1927 they carried 359,019,660 passengers. The elevated system is a going concern. Its service can be improved and its capacity further enlarged by modern, commodious cars. But this cannot be done on a 5-cent fare.

It would take a billion dollars, according to the cost of the new city subways per passenger, to replace the existing elevated lines as passenger carriers based on Board of Transportation traffic estimates for conditions in 1940.

Had the elevated fares per passenger equaled the cost on the I.R.T. subways the net earnings for the last nine years, capitalized at 6 per cent, amount to \$136,821,300 as compared with \$152,536,574 existing bonds and stocks.

SURFACE LINES STILL USEFUL

The surface lines continue to be the neighborhood convenience and necessity. Last year 997,251,460 fares were collected and this slight decrease from the peak of 1924 is not indicative of a permanent falling off. These lines take in about \$50,000,000 and spend about \$40,000,000. There has been an increase of 50 per cent in surface car passengers during the development of the subway traffic.

In 1926 the bureau of valuation of the commission showed the following for the surface lines:

Original cost	\$159,762,000
Reproduction cost	327,428,000
Cost of condition	12,410,000
Depreciation (1926 prices)	114,392,000
The total capital of the companies amounts to	
Bonds	158,532,588
Stocks	85,322,213
Total	\$244,054,801

All the surface line companies protested these commission figures as not including all elements of value. These figures show that at a fare, say 7 cents, four rides for 25 cents, the surface lines would be reasonably self-supporting. Earnings would increase and costs decrease were the lines to modernize.

The ghastliest joke on the street and electric railway industry in America, in which about six billion dollars are invested, is the impression created on the financial interests by the street cars that are operated in lower Broadway through the heart of the financial district. They are old and out of date, noisy, slow to get started and don't run fast when they do, expensive to operate, and subject to frequent failures and push-ins. The electric railway interests could well have afforded to get control of this company, equip it with the best and show what a surface line can do even in congested Manhattan.

In lower Manhattan and on certain narrow streets surface lines could not be operated because of traffic congestion. On wider streets, where there is heavier street car travel, surface lines expedite more people than they delay and carry more people with less use of the streets than any other vehicle. If street cars were abandoned and buses used there would be added the finishing touch to New York's traffic congestion.

The underlying leases that have been criticised for so many years have practically all been lowered or abolished. Receiverships and disintegration have accomplished what the companies found it difficult to accomplish. No leases remain that are subject to honest criticism. Beginning with the receiverships and disintegration of the Metropolitan Street Railways in 1907, the receiverships of the New York Railways and the Brooklyn lines in 1919 and various reorganizations, these leases were wiped out. The sole remaining lease of any importance is the I.R.T. lease of the Manhattan Elevated and this rental has been lowered from 7 to 5 per cent.

MOTOR BUSES UNSUITABLE

Motor buses cannot supersede the street cars in handling all surface traffic without a great increase in cost that may be estimated at \$25,000,000 to \$40,000,000 a year and worse interference with other traffic than street cars. For example, it would take more than five times the Fifth Avenue buses to handle only the Third Avenue street car passengers. At 10 cents the extra cost for this traffic would be \$13,000,000.

For crosstown use in narrow streets where the lines of traffic are frequently diverted and also as feeders to surface and rapid transit lines there is a wide field for buses in New York. But there is no place for them in competition with the surface lines because they cripple the service of the surface lines and ultimately stop them without being able to handle all the traffic as well, nor as economically, nor as speedily. Where they are needed they should be co-ordinated with present lines.

RAPID TRANSIT COMPANY EARNINGS FOR POOLING

For three years the companies have earned more than their charges under Contracts Nos. 3 and 4 as follows:

	I.R.T.	N.Y.R.T.	Total
1925	\$725,230	\$678,239	\$1,403,469
1926	3,078,514	826,336	3,904,850
1927	2,669,895	2,128,282	4,798,177

Had there been no accumulated deficits these amounts would have been paid the city. But they were applied to reduce the companies' deficits, which were as follows June 30, 1927:

I.R.T.	\$2,771,396
N.Y.R.T.	14,192,706

These deficits do not include certain items and claims of the companies. The I.R.T. deficit will probably be wiped out in a few years, but that does not mean the city will receive any rental as the company is behind with depreciation and there is deferred maintenance. The same is true, but in greater measure, of the N.Y.R.T. The net earnings of both companies will be decreased by the competition of the new city subways.

The recapture of the city-owned lines in Contracts Nos. 3 and 4 without the purchase of the remaining lines of each system would present serious problems of disruption of present routes and service or joint operation. The recapture provisions are chiefly of value in definitely fixing the basis on which the city shall pay for the companies' investment in the event of purchase by the city.

If the city recaptures the rapid transit lines it will have to pay the cost of the companies' original contribution to construction and the cost of equipment plus 15 per cent, and lower percentages on additions less 1/39th each year after the tenth year, notwithstanding the companies have already received in large amounts sinking fund installments. Thus the city would pay about 25 per cent more than it is obligated to pay out of fares if the companies continue to operate the lines. The amount the city must pay is decreasing about \$4,000,000 per year, which represents the increase in the city's equity under the dual contracts.

The annual charges received by the companies are definite and run until the end of the contracts, about 1968 or 1969. Assuming 1968 as the end, the companies would receive a total of \$432,000,000. If the city recaptures the lines in 1927 and issues 50-year bonds at 5 per cent and the charges ran for 50 years it would aggregate a cost of \$449,000,000.

In the event of recapture there would be four operating systems instead of three. This would give higher fares in going about the city. There would be discontinuity in the systems, making for difficulty with passengers and controlling bodies. Legal difficulties are also found in any attempt to apply the recapture clauses.

After recapture of city-owned lines of the B.-M.T. and East Side I.R.T. the city would have for subsidized operation lines handling about 700,000,000 passengers a year, 25 per cent of the traffic, carried partly by taxation and tax exemption and partly by fares. The several companies, including the surface lines, would have for self-supporting operation lines handling about 2,100,000,000 passengers a year, 75 per cent of the traffic. They would have great difficulty in giving service in competition with city subsidized subways operating with a fixed 5-cent fare.

Thus, recapture touches but 25 per cent of the transportation problem.

Free Rides Given in El Paso

DETAILS of the chartering of the El Paso Electric Railway for 1½ hours on May 27 last are given in the company's brief filed in connection with the 1927 Coffin Prize. The chartering company was the Popular Dry Goods Company, which, in May of this year, celebrated its 25th year in business by a special sale. In the opinion of the management of this store, there could be no better accompaniment for such an event than to give the public an opportunity to ride free to its store between the hours of 8:15 and 10 a.m. Between these hours the fare box openings on the El Paso cars were closed with wooden plugs and the railway operators courteously informed all passengers that they were riding free, as guests of the Popular Dry Goods Company. At the store tickets were given away, available on the car lines for a return trip up to 7 p.m. of the same day. During the hour and 45 minutes in the morning mentioned two other car lines which usually do not pass this dry goods store were routed by it. The fact that the dry goods company would provide these rides was well advertised by it in advance.

A check of inbound passengers on all lines during these hours was made and found to result in 4,296 adults and 858 half fares. These were billed to the merchant at regular rates. The number carried was about 2,781 above normal during those hours.

Improved Service Builds Business in Chicago

Chicago Surface Lines continues to increase revenue and reduce costs with better cars on smooth track, closer schedule supervision and higher standard of maintenance. Increased revenue and reduced cost are shown in company's Coffin Award brief

When You Go to the Movies—

Use the street car and enjoy the show while the other fellow's hunting a place to park.

Go to Church

All of Chicago's beautiful churches can be reached conveniently by street car. Attend services somewhere next Sunday.

HALLOWEEN

Boys: Enjoy Halloween without damaging property or interfering with the comfort of others. Schools, clubs and churches are cooperating to make it a night of wholesome fun.

The Great Outdoors

Beautiful spring awaits you in the parks.
THE SURFACE LINES ARE MOST CONVENIENT



Why Street Car Riding Grows

Did you ever stop to consider the significance of the steady increase in street car riding in Chicago?

Do you know why, in spite of the growing number of automobiles, there were 221,000,000 more rides on the Surface Lines last year than in 1922 and 57,000,000 more than in 1925?

The reason becomes apparent upon a moment's consideration.

It is because street car service meets the needs of the people of Chicago better than that of any other transportation agency.

Surface Lines tracks reach all parts of the city. Every business section and every residential community is easily accessible by one or more of the many Surface Lines routes.

And Chicago citizens have learned that they save time and effort by using street cars in going to work or shopping during the day or to the theater in the evening.

There is no substitute for street car service.

CHICAGO SURFACE LINES

Angus Sullivan
President

Car cards and newspaper ads used by Chicago Surface Lines

At the left are shown ride building ceiling cards used in Chicago cars.

The advertisement in the center is newspaper copy used by the Chicago Surface Lines to tell its story directly and frankly.

As shown at the right, passenger good will is the objective of these brief talks with the rider, carried on ceiling cards in the car.

CHICAGO SURFACE LINES
COURTEOUS SERVICE
As a class Surface Lines trainmen are efficient and courteous and we are proud of them.
Passengers can help us maintain the standard of service by reporting any incivility or discourtesy.

CHICAGO SURFACE LINES
You Are Entitled to Light
Trainmen have strict orders to use the lights whenever they are needed.
If at any time there is insufficient light, passengers are requested to notify the conductor.

CHICAGO SURFACE LINES
COURTESY
Surface Lines trainmen realize that courteousness of one of their number reflects upon all of them.
You help the conscientious trainmen and contribute to better service when you report incivility.

CHICAGO SURFACE LINES
Why Worry About Parking?
Do away with parking worries by going to the theater or movie by street car.
You will make the trip comfortably, safely and quickly and will enjoy the show more.

the one hand, has brought steadily increased revenues, while higher standards of maintenance and greater operating efficiency have resulted in large savings in cost. A policy of rigid insistence on employee efficiency, combined with square dealing, has won the loyalty and support of the largest and most powerful union organization in the industry, which even in the midst of wage negotiations recently went out of its way to defend the Chicago transportation

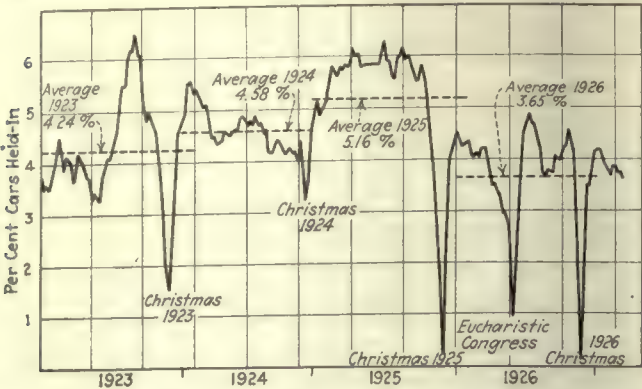
companies against unwarranted attack by other trades unions in the city.

Something of the spirit and point of view that have actuated these companies was outlined in the **ELECTRIC RAILWAY JOURNAL** of April 26, 1926, page 708. The

Year Ended Jan. 31	Revenue	Passengers	Per Cent Increase
1923	762,629,211		...
1924	824,850,103		8.16
1925	830,151,540		0.64
1926	842,201,453		1.45
1927	876,249,663		4.04

FAILURE of various attempts to reach a franchise settlement have not deterred the Chicago Surface Lines from continuing its program of service improvement, started a number of years ago in the face of the then expiring franchises under which the properties operated. Since February, 1927, negotiations have been carried on under temporary grants while awaiting permanent settlement. Despite this situation there has been no let-up in the program of providing better, faster and more regular service, a higher standard of maintenance for cars and track, better trained employees—in short, better transportation.

The management has continued to have faith in the power of its demonstration of sincerity ultimately to win a equitable franchise settlement that will be fair both to the community and the company's investors. There is, however, no altruism in this program. It has continued to prove itself good business. Service improvement, on



Co-operation between the shops and transportation departments permits maximum utilization of equipment during holiday peak season

results which have followed testify vividly to the wisdom of the company's policy as shown in the tabulation on page 819.

Annual gross earnings in five years increased from \$56,103,061 to \$61,173,601, or 9.04 per cent. During 4½ months of the year ended Jan. 31, 1923, with which comparison is made, there was an 8-cent fare in effect, which was subsequently reduced to 7 cents. From 1923 to 1927 private automobiles increased 84 per cent and the operations of an independent bus company were widely extended. Again, while the gross earnings increased 4.06 per cent in 1926, operating costs rose 2.07 per cent, but residue or net receipts were increased 9.41 per cent, thus showing a material increase in efficiency. It is also significant that the average speed maintained on surface cars during 24 hours for the entire system rose from 10.73 m.p.h. in 1921 to 10.92 m.p.h. in 1924 and 11.18 m.p.h. in 1927. Still further light is thrown on the results accomplished by the fact that the number of car-miles operated has increased from 122,161,073 in 1923 to 132,451,712 in 1926, an increase of 8.42 per cent.

Operating ratios, including 8 per cent of gross earnings allotted for renewals and depreciation and exclusive of taxes, show a steady decrease as follows:

Years	Operating Ratio, Per Cent
1924.....	75.17
1925.....	74.11
1926.....	72.70

Without depreciation the 1926 ratio was 64.75 per cent, this being 5.17 per cent lower than the average for 42 principal companies throughout the country.

MODERN CARS PURCHASED FROM RENEWAL FUND

New cars to the number of 445 were added to the system during the last three years. This was done, despite inability to obtain capital because of the franchise situation, by use of the reserves set aside for renewals. All of the 445 units are equipped with pneumatically operated doors. Two hundred and forty-five of the cars have automatic exit doors. Low steps and wide platforms to speed up the movement of passengers are other features of Chicago rolling stock. Fifteen inches is the maximum height for the first step and the platform width permits three persons to board and alight at the same time.

Included in the car program was an articulated unit, built in 1925 from two old double-truck cars. This was an experiment. The costs of construction, coupled with the result of tests, influenced the management against further construction along this line. There has been expended for new car equipment and extensions a total of \$7,848,000.

During the time that this new equipment was being purchased existing cars on the system were overhauled into first-class condition. In 1923 a progressive overhaul and repair schedule was set up. At first the basis of overhaul was three to four years. Beginning with 1925, however, this was changed, so that since that time every

Financial Summary of the Chicago Surface Lines for the Fiscal Years ended Jan. 31, from 1922 to 1927, Shows the Steady Increase in Riding and the Increased Operating Efficiency Resulting from the Management's Progressive Policies

	1927	1926	1925	1924	1923	1922
Passenger revenue.....	\$60,436,705.93	\$58,076,487.22	\$57,284,602.06	\$56,986,687.82	\$55,495,310.69	\$59,706,412.72
Other revenue.....	736,895.27	709,393.51	797,076.14	668,481.91	607,751.24	637,320.47
Gross earnings.....	\$61,173,601.20	\$58,785,880.73	\$58,081,678.20	\$57,655,169.73	\$56,103,061.93	\$60,343,733.19
	7-cent fare	7-cent fare	7-cent fare	7-cent fare	Fare 8-cent to 6-14-24 7-cent thereafter	8-cent fare
Operating Expenses:						
Way and structures.....	\$2,984,484.50	\$2,830,649.58	\$2,859,869.95	\$2,682,066.36	\$2,556,627.18	\$3,040,939.66
Equipment.....	4,188,633.15	3,984,635.24	4,148,282.10	3,858,865.16	3,788,170.59	4,348,372.65
Renewals.....	4,893,888.08	4,702,870.47	4,646,534.24	4,612,413.59	4,488,244.96	4,827,498.67
Power-maintenance.....	386,086.82	394,620.73	376,062.63	361,955.71	316,449.77	320,375.52
Power-operation.....	3,638,283.15	3,465,460.05	3,466,857.30	3,321,683.08	3,175,390.97	3,128,792.32
Conducting transportation—trainmen.....	21,485,750.20	20,741,205.68	20,890,865.98	19,640,721.02	19,662,636.31	21,574,699.34
Conducting transportation—other.....	3,214,031.29	3,172,423.05	3,177,461.10	3,030,582.88	2,912,780.47	3,208,603.47
Traffic.....	123,433.08	109,973.48	102,793.44	44,208.18	42,092.79	34,546.97
General and miscellaneous—damages.....	1,936,202.48	2,469,007.01	2,439,430.49	2,421,517.13	2,356,328.59	2,271,224.06
General and miscellaneous—other.....	1,620,696.77	1,697,361.31	1,551,803.24	1,695,740.04	1,859,348.09	1,568,097.52
Total operating expenses.....	\$44,471,489.52	\$43,568,206.60	\$43,659,960.47	\$41,669,753.15	\$41,158,069.72	\$44,323,150.18
Balance.....	\$16,702,111.68	\$15,217,674.13	\$14,421,717.73	\$15,985,416.58	\$14,944,992.21	\$16,020,583.01
Taxes.....	\$3,400,000.00	\$3,060,000.00	\$2,915,000.00	\$3,170,000.00	\$3,258,000.00	\$2,193,000.00
Residue receipts.....	13,302,111.68	12,157,674.13	11,506,717.73	12,815,416.58	11,686,992.21	13,827,583.01
Operating ratio (excluding taxes), per cent.....	72.70	74.11	75.17	72.27	73.36	73.45
Miles single track operated.....	1,008	1,003	997	993	993	993
Average maximum number cars operated (week days only).....	3,367	3,234	3,209	3,134	2,982	2,982
Revenue passengers carried.....	876,249,663	842,201,463	830,151,540	824,850,103	762,629,211	750,515,622
Transfer passengers carried.....	651,224,394	626,365,104	616,552,684	600,848,554	557,331,999	547,522,102
Free passengers carried.....	47,495,845	48,944,104	46,023,318	41,645,629	38,801,339	35,724,685
Total rides.....	1,574,969,902	1,517,510,661	1,492,727,542	1,467,344,286	1,358,762,549	1,333,762,409
Revenue car-miles operated.....	132,451,712	128,398,420	127,213,599	122,161,073	116,131,909	118,446,404
Revenue car-hours (paid for).....	14,788,514	14,269,909	14,381,497	13,899,147	13,186,984	13,548,089
Passenger revenue per revenue car-mile, cents.....	45.63	45.23	45.03	46.65	47.79	50.41
Passenger revenue per revenue car-hour.....	\$4.09	\$4.07	\$3.98	\$4.10	\$4.21	\$4.41
Operating expenses per revenue car-mile, cents.....	33.58	33.93	34.32	34.11	35.14	37.42
Operating expenses per revenue car-hour.....	\$3.01	\$3.05	\$3.04	\$3.00	\$3.12	\$3.27

car goes through the shops every two years, with the following result:

Year	No. of Cars Overhauled	Average Cost of Overhauling	Miles Operated Per Car Overhauled
1922.....	822	851.93	140,800
1923.....	803	761.14	150,900
1924.....	1,000	832.21	126,820
1925.....	1,467	461.40	87,300
1926.....	1,517	457.97	87,200

These figures forcibly reveal the economy of a high standard of maintenance. It is a short story: Number of cars overhauled almost doubled, cost reduced almost one-half. To this should be added the figures for the routine maintenance costs, which speak for themselves. In 1922 it cost \$3.28 per 1,000 car-miles for equipment maintenance, as compared with \$3.13 in 1926.

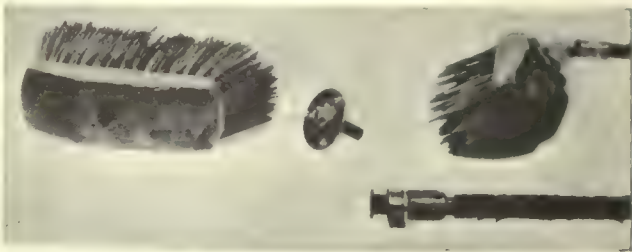
In judging these figures it should be remembered that a wage scale as high as any in effect anywhere in the industry is paid in Chicago. Under this scale repairmen are paid 75 cents per hour, carpenters 64 to 90 cents, machinists \$1 to \$1.05, machinist helpers 70 to 75 cents, shop controllers and car wiremen \$1 and other trades on a comparable level. These high rates, have, however, been offset by increased efficiency, which is partly shown by the following tabulations:

Year	No. of Carhouse Employees	Car-Miles Per Year Per Man	Cars Per Man
1922.....	1,258	91,924	2.54
1926.....	1,325	99,908	2.69

Year	Employees Shop and Equipment Department	Employees Per 100,000 Miles Operated
1922.....	2,238	1.93
1923.....	2,405*	1.98
1924.....	2,484*	1.95
1925.....	2,343*	1.83
1926.....	2,304	1.74

*Men employed solely on new car construction are included.

Included in the general plan of overhauling all cars of the system have been painted, the color scheme being pared set off by cream-colored posts, a decided change for the better from the old standard dark green bodies and cherry posts of the period prior to 1920. In addition to this, the Chicago Surface Lines believes in daily and weekly housecleaning. Every day the cars are swept, floors and interiors are disinfected and curtain moldings and lights are thoroughly cleaned. On the present washing schedule, 4,870 cars are thoroughly washed per week. Since the total number of cars on the system is 3,639, this schedule puts the cars through on an average of more than once per week. Compressed air is used to clean



Fountain brushes are used to wash Chicago cars thoroughly and quickly

heaters, sign boxes and curtains. All interior woodwork, floors and seats are scrubbed.

Pull-ins, which are a serious handicap in providing speedy and reliable service, have been effectively reduced on the Chicago system by intensive work and co-operation between the transportation and equipment departments. In 1926 the car-miles per pull-in were 14,839, compared with 7,100 in 1925. This represents an improvement of 103 per cent in twelve months. To this record may be added the fact that the mileage operated by the system during 1926 averaged 37,445 miles per motor car on the property. Records also show that on Dec. 20 last 100 per cent of the 3,639 cars owned by the company were in operation and that on the three days succeeding there was only one car out of service.

GREATER USE OF EQUIPMENT

It is significant at this juncture to comment on figures for car operation for the three years ended Jan. 31, 1923, as compared with the three years ended Jan. 31, this year. The score stands: Number of cars operated as of Jan. 3, 1923, per 10,000 riders, 7.87, against 7.35 for the period ended Jan. 31, 1927. Despite this reduction of 6.6 per cent in the number of cars per 10,000 riders the percentage of passengers per car in rush hours was decreased 12 per cent by improved scheduling. By re-routing, more scientific scheduling and better maintenance, which all lead toward more efficient use of available equipment, the following estimated savings were made:

Total cars owned (prior to Nov. 1926).....	3,539
Average pay time per rush-hour car, hours.....	8.2
Average cost that varies with car operation per car-hour.....	\$2.50
Effective days in year.....	300
14.6 per cent of 3,539.....	517
Saving per year in operating cost.....	\$3,170,000
Reduced investment at \$20,000 per car, including storage.....	\$10,320,000
Reduced interest on investment.....	\$516,000
Total reduction in operating expenses and interest charges.....	\$3,686,000



Clean cars are considered an important element in building a satisfied patronage for the Chicago Surface Lines. The 3,639 cars on the property are thoroughly washed more than once a week



Special clips made in the company's shops are used to support two ceiling cards in each car

The 14.6 per cent is arrived at on the basis that to have provided the present service under the old conditions would have required 12 per cent more cars in each direction, which would be 8 per cent of all the cars operated. Further, since all cars owned were in use, an increase of 8 per cent in rush-hour equipment would have necessitated the purchase of that percentage of new rolling stock.

TRAFFIC CHECKS SPEED SERVICE

While only 12 per cent of all rides on the system are taken within the business district, the relief from congestion in this area due to special traffic studies has had a marked effect on the system as a whole. A 10 to 30 per cent reduction in traffic obstructions was accomplished by rerouting and by the consequent elimination of 11,000 car turns per day in the Loop district. At the same time the results accomplished led the city to prohibit left-hand turns by all vehicles in the business district. A 14 per cent increase in service, an 8.42 per cent rise in revenue car-miles and a 10 per cent rise in seat-miles are some of the results. These figures when translated amount to an increase in car-miles from 122,161,073 in 1923 to 132,451,712 as of 1926, and seat-miles increased from 5,339,660,501 to 5,875,557,944. The latter is due in some respects to new cars having 52 seats each.

Success obtained by the company in improving traffic conditions in the Loop area led to co-operation by the city

SCHEDULE NUMBER OF CARS CROSSING VARIOUS HEAVY INTERSECTIONS DURING THE MAXIMUM ONE-HALF HOUR IN CHICAGO

	Cars Pass
Grand, Halsted and Milwaukee Streets.....	269
Madison and Clark Streets.....	197
Halsted and Archer Streets.....	153
Clark and Lake Streets.....	145
State and Lake Streets.....	137
Clark and Division Streets.....	169

NUMBER OF CARS ONE WAY PER MAXIMUM ONE-HALF HOUR VARIOUS KEY LOCATIONS IN CHICAGO

Milwaukee Avenue, southbound, Elston Avenue to Desplaines Street ..	100
Clark Street, southbound, Diversey Parkway to Division Street.....	86
Clark Street, southbound, Center Street to Wells Street.....	125
Wabash Avenue, southbound, Randolph Street to Harrison Street.....	96

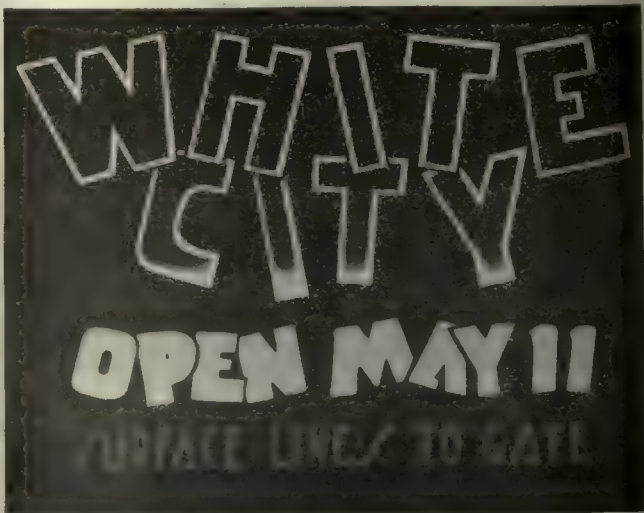
RESPONSE IN RIDERS

Year Ended	Weekday Average	Saturday Average	Sunday* Average	Total for Year
Jan. 31, 1923.....	2,204,425	2,356,385	1,563,911	762,629,211
Jan. 31, 1924.....	2,354,139	2,521,487	1,623,414	824,850,103
Jan. 31, 1925.....	2,373,114	2,512,121	1,614,823	830,151,540
Jan. 31, 1926.....	2,424,194	2,507,004	1,631,484	842,201,433
Jan. 31, 1927.....	2,521,897	2,668,342	1,632,844	876,249,663

*Includes holidays.

in the initiation of similar studies over the systems. The schedule and traffic department was increased from eleven to 40 highly trained men. New forms were drafted and closer co-operation maintained between trainmen, supervisors and civic bodies. Special checks are made by conductors to supplement the records of the schedule force. Specialists analyze terminal conditions and traffic interferences. These agent reports are compiled for office use and when combined with analyses of the operating and supervisory practices of the transportation department form the basis for revisions in running time. Schedule checkers follow up the company's operations by checking variables in running time, headway and terminal time. This work develops detailed data for transportation and supervisory forces. On certain heavy lines, where headways are close, increased service is provided by two-car trains of the multiple-unit type, operated on a carefully balanced schedule during the rush hours.

A concrete example of what has been accomplished by keeping service carefully balanced to the needs of a given line is furnished by the history of a crosstown line located on the south side. Five years ago nine two-man cars were operated on this line and the yearly revenue passengers stood at 1,939,722. It was decided that better service could be given by one-man operation (there are



Types of posters used in the ends of Chicago cars to stimulate riding

one-man cars on the system, the number being restricted by state authority). Twelve cars of this type were subsequently placed in service. This reduced the headway and inversely increased the riding. Schedules were revised. More cars were added. With twenty one-man cars operating during the week from Feb. 8 to 14, 1925, 13,743 passengers were carried compared with 99,113 passengers per week transported by the nine original two-man units in service prior to April 1, 1923. Growth of population and business made it expedient to change back to two-man operation. The line was extended 1 mile last year into an undeveloped area. The net results stand at this writing: 6,766,840 revenue passengers per year, which is a 249 per cent increase over the fiscal year ended Jan. 31, 1922; average of 22 cars and 1,171,798 car-miles operated per year, representing an increase of 9 per cent.

TRAFFIC PROBLEM SEVERE

The staggering traffic problem confronting the Chicago Surface Lines may be appreciated when it is known that normally between 7 a.m. and 7 p.m. there are 570,000 rides per day into and out of the business districts provided by 17,000 cars. This represents 57.8 per cent of all passengers using surface vehicles in the area. Fifteen thousand vehicles enter or leave the business area (about $\frac{1}{4}$ of a square mile) during the peak half hour, and 1,136 street cars must cross the district boundaries during the same period. Despite a constant increase in private vehicular traffic, the results obtained in speeding up the three main traffic arteries through the congested loop district are indicated by the following figures:

	1924 M.P.H.	1926 M.P.H.	Increase Per Cent
Wabash Avenue.....	4.32	6.17	42.8
State Street.....	3.66	6.10	66.7
Clark Street.....	4.88	6.65	36.3

While analysis and revision of schedules have been largely responsible for these speed figures, there is another important factor to be mentioned, i.e., traffic direction by an expert force of company men who in the central district assist the police in moving traffic during the rush hours. These men are dressed in uniforms closely resembling those of the police. Augmenting this traffic control there is a liaison between the company traffic officers and dispatchers at the central offices which is maintained by street telephones. Further improvement in service was brought about by the company's anti-parking campaign and the subsequent regulation by the City Council, which revealed, incidentally, that automobiles had increased from 12,000 in 1910 to 341,000 in 1925. This increase brought 122,726 trips of vehicles to the central business district during a normal business day. The district is capable of accommodating only 157 parked vehicles at a time and there is parking room during a twelve-hour day for only 18,222 vehicles. A survey conducted by employees of various retail business concerns among 96,082 of their patrons showed that 505, or 1.57 per cent, came in automobiles, which were parked at the curb.

As the result of sifting out the other causes of delays, parades and other pageants were ruled off certain busy streets, through the co-operation of the civic authorities. Front-end collectors, who are stationed at heavy transfer points during the peak loads, and the skip-stop system, authorized in 1918, are other contributions to speedy service.

Detroit Street Traffic Survey

Report reveals that city is less than 50 per cent efficient in the use of its streets. Only 19.1 per cent travel by private auto

DETROIT'S annual economic loss, due to traffic congestion and delay, is estimated as more than \$30,000,000. Detroit, in common with all large American cities, is less than 50 per cent efficient in the use of its streets. The recognition of the need for reducing traffic hazards and the economic losses due to traffic congestion and the possibility of making more efficient use of the highways prompted the city, through the Department of Police, to make a traffic survey.

The survey, which deals principally with private automobile traffic, contains some interesting information about general vehicular travel. A table listing the mode of transportation used by customers of 27 Detroit stores over a three-day period reveals that only 19.1 per cent use private autos, while 80.9 per cent resort to the street car and motor bus. Data on private auto traffic, the 19.1 per cent, comprise the bulk of the report.

The work includes alley traffic, street parking, garage and lot parking and business district traffic flow surveys, in addition to a study of economical vehicular speed.

The division on alley parking points out many unfavorable conditions, such as absence of street numbers, parking of private automobiles, storing rubbish or construction material in alleys and obstructive truck parking.

It was shown in the section covering street parking that many violations of parking regulations were being made.

INCREASING VEHICULAR SPEED

Under the subject of "Economical Vehicular Speed" appear data on the use of automatic traffic signals and suggestions for increasing vehicular speed. The report further states: "We believe that 'rush-hour' traffic should be given special preference by keeping open for moving vehicles the full width of pavement in the direction of the greatest traffic movement. Slow-moving vehicles obstruct traffic, diminish the number of vehicles that can pass a given point in a given time and increase the amount of passing of one vehicle by another, thus adding to confusion and danger. Certain vehicles, such as heavy trucks, which inherently proceed at slow speed, are required to travel close to the curb. This requirement is fairly well observed, but fails to solve the problem of interference with free movement caused by the presence of other slow-moving vehicles.

"Street cars using the natural highest speed lane and operating on a local stop service become slow-speed vehicles and, in view of the ordinance requiring other vehicles to stop with them, have a very definite retarding action on all other vehicular movements."

It was suggested that the system of operating street cars express and buses local be given a 30-day trial on some route. It is believed by the Commissioner of Safety that such a combined service would expedite materially the flow of all types of vehicular traffic on any street where trolley cars are operated.

Diagrams showing traffic movements in the downtown district were prepared for the traffic flow survey. It is the plan to use the chart in planning platoon type signals.

The intent of the report was to point out certain con-

ditions that exist and to suggest that those interested in a more efficient use of streets and alleys lend their assistance to that end.

The suggestions at the end of the report for bettering conditions included: Further modernization of the traffic signal system, publication of information on use of signals and streets, passing further ordinances and enforcing the present ones with respect to use of alleys and streets, prohibiting improper parking and giving the combination express-trolley car and local-bus service a trial.

In the foregoing suggestions, stress was laid on co-operative endeavor because "in the final analysis," according to the report, "regulatory statutes must depend on public support to produce quick and lasting results."

Washing Frames at Edinburgh and London

They are provided with inwardly swinging horizontal pipes so as to fit any type of car or bus.

Other devices feature their design

WASHING frames for buses and cars are much more common in Europe than in the United States, despite the lower cost of labor abroad. A large railway or bus system in Europe without one or more of these washing frames is a rarity. The London General Omnibus Company has 44 garages and at least a number of them are fitted with two or three washing frames. Hence the principal interest in European washing machines is not so much in their use as in their design.

One of the accompanying illustrations shows the form used by the Edinburgh Corporation Tramways and forms part of the report at the Cleveland convention of the Engineering Association committee on motor bus garage design. A feature of this washing frame is the use of two hinged horizontal spray pipes on each side connected to the main water supply by flexible hose. These hinged spraying pipes can be swung inwardly toward the car or bus while in action, thus bringing the spray close to the sides of the vehicle. This permits the frame to be used with a great variety of equipment.

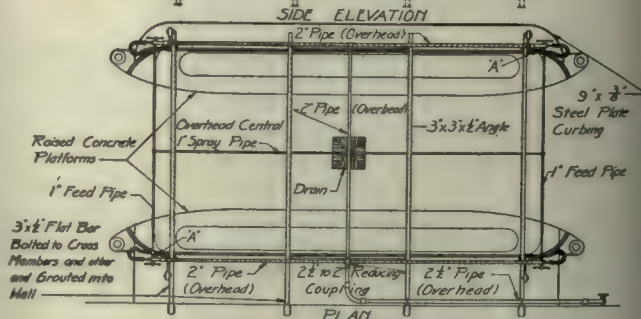
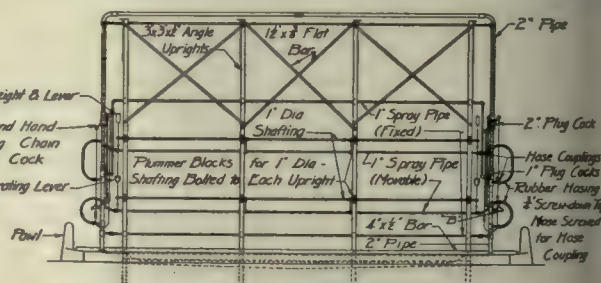
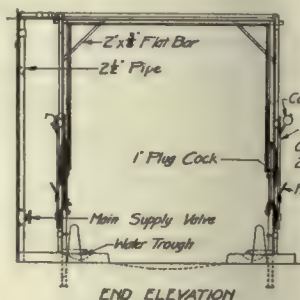
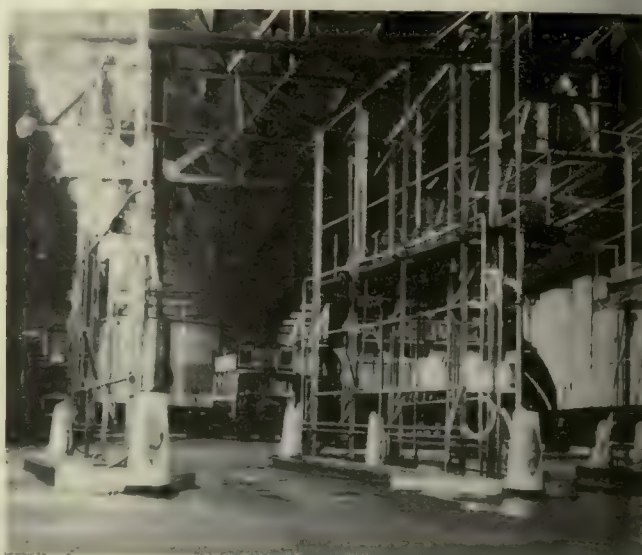
In this respect the frame is similar to the standard of the London General Omnibus Company, shown in an accompanying illustration. In both the lever arm is counterbalanced by weights, so that it is easy for the operator to set the swinging pipes at any position desired. In its use of swinging pipes the machine differs from that used for buses in Berlin and described in the issue of this paper for Sept. 3. In the Berlin example each side of the washing frame is separate and mounted on wheels. By this construction the two frames can be set at any distance apart desired and in any position. An account of still another type, that used by the Paris Surface Lines, was published on page 272 of the issue of this paper for Aug. 13, last.

The Edinburgh washing rack, to quote from the report of the committee on motor bus garage design, covers

approximately 495 sq. ft. of floor space. The extreme outside length is 29 ft. and the width between inside of island curbs is 7 ft. 9 in. These islands serve as the foundation for the frame of the machine. Rounded at the ends, they contain a trough 18 in. wide by 6 in. deep, which extends the whole length of each island.

Three men are required to operate this machine, one at either side, to manipulate the spray handles; and the third at the front end, to wash the bonnet and front part of the body. The time occupied in washing a bus is four minutes, as compared with twenty minutes under the old method, and the quantity of water used per bus has been reduced from 150 gal. to 100 gal. The water pressure is approximately 100 lb. per square inch.

The London washing frame is for a double-deck bus,



British washing racks with inwardly swinging horizontal spray pipes so as to fit any width of vehicle. The line drawing is of a rack used by the Edinburgh Corporation Tramways, the half-tone engraving of one used by the London General Omnibus Company

and there is a platform near the top on which the man who washes the roof stands, using a soft brush. The ends are protected by heavy concrete ports so that accidental sidwiping or other blows from buses will not injure the piping. The water pressure used in London is from 60 to 70 lb. per square inch.

Saving with One-Man Cars in Scranton

With completion of fifteen cars now being converted the Scranton Railway will be 100 per cent one-man equipped, with a marked reduction in operating cost

BY C. G. KEEN

Railway Engineer General Engineering & Management Corporation, New York

WHEN the General Engineering & Management Corporation actively entered the street railway field early in 1925 there were numerous problems to solve, many of which have a general interest. Of major importance was the Scranton Railway, and as it was the largest property in the railway group acquired it deservedly received a large share of attention. An extensive track rebuilding program was at once inaugurated and studies were undertaken to effect savings in operating costs.

This company operated at that time about 100 passenger cars in normal daily service, over 103 miles of track, serving the city of Scranton and running to Mosic on the southwest and to Carbondale and Forest City on the northeast and including about 10 miles of track rented from the Scranton, Dunmore & Moosic Lake Railroad to Moosic Lake on the east. The entire system was run with two men per car. This seemed to be the logical place to make economies. A large part of the car equipment was obsolete, and while some cars were with rebuilding, it was decided to purchase at once ten new light-weight, double-truck, double-end, one-man, two-man cars. A careful review of the existing equipment was made and 35 cars were selected to be rebuilt and to be furnished with safety control at once.

The new cars were carefully designed, with no thought except the comfort of the passenger and safe and economical operation. These cars were described in *ELECTRIC RAILWAY JOURNAL* of Aug. 14, 1926.

Rehabilitation of the 35 old cars in 1925 was the first step of a general plan to furnish the entire system with cars that could be operated by one man with safety so as to obtain the resultant savings. The preliminary study showed about \$3,000 per year per car reduction in platform labor cost by one-man operation, assuming 52,000 car-miles run. The cost of the change would be about \$500 per car. The work of conversion was pushed vigorously and the cars were soon on the road with full safety devices and pneumatic door engine control. Line switches were installed and general repairs made.

The savings were at once apparent and the platform costs were reduced approximately as estimated. However, because of the installation of traffic signals in the central city, the schedule speeds were slowed down and the full savings were not realized. Nevertheless the program was prosecuted with vigor and in 1926 twelve more new cars were purchased. These were identical with those bought in 1925 and were described in *ELECTRIC RAILWAY JOURNAL* of Jan. 29, 1927. Twenty more cars were rebuilt. A brief account of the changes on ten of these appeared in the *JOURNAL* of Dec. 18, 1926.

With 22 new cars and 55 others converted to safety cars the average platform expense on the entire system was cut nearly 5 cents per car-mile, amounting in all to about \$80,000 per year. As the total cost of new cars and rebuilding of the old ones was about \$503,000, a good

return was shown on the investment. In the face of generally unsatisfactory business conditions, particularly in and around Scranton, this is a very satisfactory showing and is highly important.

At present fifteen cars are going through the shops, the changes on five costing \$1,500 each and on ten costing \$3,500 each. The cars in the latter class need considerable overhauling, but the greatest cause of the difference in cost is elimination of multiple-unit control and the substitution of hand controllers. This latter change was decided upon because of the expense of maintaining the multiple control with no corresponding benefit, as there are no cars now operated in trains in Scranton.

With the completion of these fifteen cars the city of Scranton will be 100 per cent one-man operated. This, in view of the traffic density, is remarkable and was not thought possible by many who had studied the situation previously.

The safety features of these cars are the standard adopted for all cars operated under the management of the General Engineering & Management Corporation. They permit the greatest flexibility of operation. C. A. Brooks, manager of railways for the General Engineering & Management Corporation, has been the prime mover in all of this work and has devoted a large part of his time to obtaining the economies mentioned. H. H. Dartt, vice-president and general manager of the Scranton Railway, is in direct charge of the construction and operation of this equipment.

Freight Accounting for 25 Depots Centralized

CENTRALIZED station accounting, by a systematized plan devised and installed by C. R. Mahan, comptroller Chicago, North Shore & Milwaukee Railroad, is reported by that company to be in successful operation at the present time in the office of the auditor of freight accounts at Highland Park, Ill.

The accounting activities for the 25 freight and merchandise dispatch deposits located on the North Shore Line are now cared for by the auditor of freight accounts and a staff of 22 employees at the Highland Park office. Approximately 50,000 waybills are handled through this office each month. The use of Powers accounting machines in the compilation of station accounts has proved particularly advantageous.

According to Mr. Mahan, author of the system, the principal advantages of the centralized station accounting plan are as follows:

Station freight accounting is completely divorced from the station and consolidated in a centralized department under the jurisdiction and supervision of the auditor of freight accounts.

The station agent is relieved of considerable detail work, thereby permitting him to give more time to the solicitation of business. The new system also eliminates the factor of accounting experience when selecting new agents or other freight station employees.

It provides a more adequate accounting control over the station accounts and reduces the work of a traveling auditor approximately 65 per cent. By use of the accounting machines in handling this work the number of employees usually required is reduced, as also is the possibility of error due to the human element. In addition the machines speed up accounting work and minimize the labor cost of securing freight statistics.



Public Serviceville, Louisiana Has a Population of Twenty Thousand

—However there is a Public Serviceville. The employees of the New Orleans Public Service Inc. form an integral part of the city of the great city.



The Safest Place on The Streets

—More than twenty thousand people were killed at 1925 on the streets and highways of this country by moving vehicles.

—It is the safest place on the streets, because the majority of the population of this country are given a safe place to travel.

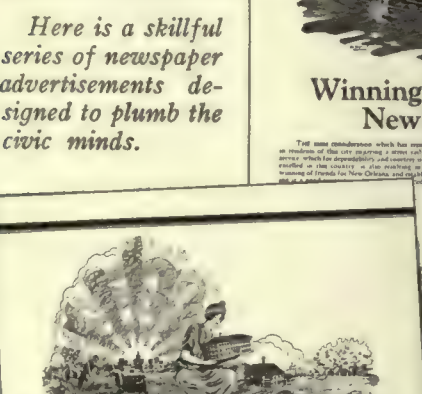
—Let thousands of people were killed on the streets and highways in 1925 at annual and reported accidents greater than the total population of New Orleans.

—A New danger has sprung up in our large cities, more insidious than the epidemic that formerly swept them. It lurks on the streets and the sidewalks of every city, and the safety of every citizen is in danger.

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New Orleans Public



Here is a skillful series of newspaper advertisements designed to plumb the civic minds.

—It is generally indicated that in the most successful of the great cities—the Spirit of Transportation—has been the most successful in the world.

—It is generally indicated that in the most successful of the great cities—the Spirit of Transportation—has been the most successful in the world.

—It is generally indicated that in the most successful of the great cities—the Spirit of Transportation—has been the most successful in the world.

Transportation Builds School Houses and Homes

—It is generally indicated that in the most successful of the great cities—the Spirit of Transportation—has been the most successful in the world.

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—It is generally indicated that in the most successful of the great cities—the Spirit of Transportation—has been the most successful in the world.

New Orleans Public Service Inc.



Around The World Fifty Times Without a Breakdown!

A world's record for the longest continuous run of a train was set by the New Orleans Public Service Inc. when it ran a train around the world for 50 times without a breakdown.

—It is a record that is a tribute to the skill and endurance of the men who operate the trains.

—It is a record that is a tribute to the skill and endurance of the men who operate the trains.

—It is a record that is a tribute to the skill and endurance of the men who operate the trains.

New Orleans Public Service Inc.



New Orleans Public Service Company Believes in Advertising

—The New Orleans Public Service Company believes in advertising.

—The New Orleans Public Service Company believes in advertising.

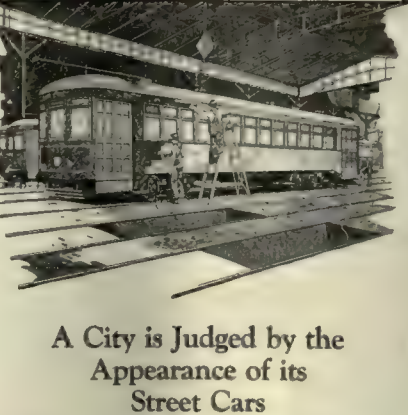
—The New Orleans Public Service Company believes in advertising.

Winning Friends For New Orleans

—The New Orleans Public Service Company believes in advertising.

—The New Orleans Public Service Company believes in advertising.

—The New Orleans Public Service Company believes in advertising.



A City is Judged by the Appearance of its Street Cars

—Call on a mental picture of any city you have ever seen. The first thing that strikes you is the appearance of the street cars.

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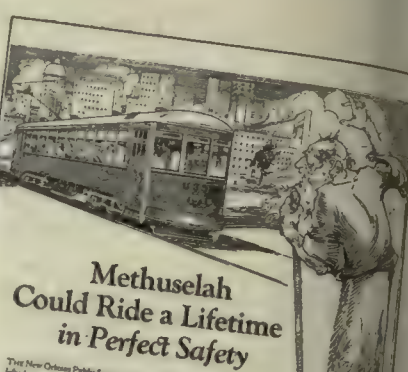
—Call on a mental picture of any city you have ever seen. The first thing that strikes you is the appearance of the street cars.

A Forest is Under the Track

—Underneath the street cars of the New Orleans Public Service Inc. is a forest.

—Underneath the street cars of the New Orleans Public Service Inc. is a forest.

—Underneath the street cars of the New Orleans Public Service Inc. is a forest.



Methuselah Could Ride a Lifetime in Perfect Safety

The New Orleans Public Service Inc. has established a record of handling 10,000,000 street car passengers in each one of its cars.

—It is a record that is a tribute to the skill and endurance of the men who operate the trains.

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A New Service Helping To Build a Greater New Orleans

—The New Orleans Public Service Inc. is helping to build a greater New Orleans.

—The New Orleans Public Service Inc. is helping to build a greater New Orleans.

—The New Orleans Public Service Inc. is helping to build a greater New Orleans.

These ads also tell a consecutive story of mass transportation and public service.

—The New Orleans Public Service Inc. is helping to build a greater New Orleans.

—The New Orleans Public Service Inc. is helping to build a greater New Orleans.

—The New Orleans Public Service Inc. is helping to build a greater New Orleans.

Lost in Traffic Congestion \$1,500,000,000

—A CARPENTER named recently by Herbert Hoover, Secretary of Commerce, has been lost in traffic congestion.

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—A CARPENTER named recently by Herbert Hoover, Secretary of Commerce, has been lost in traffic congestion.

New Orleans Public Service Inc.

Public's State of Mind Controls Car Advertising

By J. C. Barnes

Director of Advertising New Orleans Public Service, Inc., New Orleans, La.

WITH any advertisement, or series of advertisements, concerning the operation of a public utility the character of the copy necessarily must be determined from the state of mind of the community toward the utility rendering the service. This is so even in merchandising copy. What is the feeling of the community toward the utility? Is there a just appreciation of the problems involved in the service? Or is the consciousness toward the utility merely dormant, the service being taken for granted? Or, again, is the feeling toward the utility one of open hostility? These are factors which must determine the character of the copy used in a series of institutional advertisements. Thus considerations were carefully analyzed in the preparation of this series of eleven advertisements which the New Orleans Public Service, Inc., is now running in the daily press. We had no hesitancy in departing from the beaten path of advertising rules in order to meet what we considered the needs of our local situation.

This series, as it obviously will be seen, was designed primarily to awaken a street railway consciousness in the city; to cause the public to appreciate more fully the difficulties that have to be surmounted in order to render dependable street railway service; to bring about a clear appreciation of the value of such service in the growth and development of the community. Only indirectly was there any strictly sales appeal made.

The first of the series shows the magnitude of the company serving the city with gas, electricity and a street railway. However, instead of presenting this in the form of dry statistics, we introduced the idea of a new city, Public Serviceville, La. In a state where there are comparatively few cities with a population of 20,000, the designation of a city hitherto unknown and having such a large population we felt would at once arrest attention. We have shown in this advertisement the number of employees and the amount received by these employees in salaries and pensions. But the keynote of the advertisement, the message we were striving to get over, is embodied in the paragraph, "This great Public Service family of 20,000, almost 5 per cent of the total population of the city, is united, not by bonds of kinship, but by ideals of public service, and these ideals are to give the city of New Orleans, at all times, the highest degree of gas, street railway and electric service that it is possible to render."

Succeeding advertisements deal strictly with the street railway operation, the most important feature of which we considered dependability. We presented this first in

the copy captioned, "Around the World 50 Times Without a Breakdown," and were able to show in a rather startling manner the remarkable record that our company has been able to achieve in the dependability of the service. Here we make only a casual reference to the fact that the average fare paid by street car passengers in this city is considerably less than elsewhere. And it is made not so much to encourage riding the street cars as to emphasize the importance of the record for efficiency in operation.

We considered, after dependability, the next most important factor, safety, though mindful that many critics would reverse the order, and again we were able to present the record of our company in a somewhat dramatic fashion. Methuselah, a Biblical character known to practically every individual, is shown signaling a street car. There can be little doubt that the unusual contrast of this ancient figure on a modern street would arrest attention, and it was thought that the caption would arouse sufficient curiosity to inveigle one into reading the entire story. Again, in this advertisement we have studiously avoided presenting mere dry statistics.

The advertisement which followed, captioned "The Safest Place on the Streets," tells substantially the same story as the previous copy, with the exception that it shows the difficulty of handling congestion out on the streets, and while applicable to probably every city it was conceived largely with the local situation in view.

At the time the series was prepared there was nationwide discussion on the place of the bus in urban transportation. Copy in the advertisement, with the head "A New Service," was designed, first, to show our conception of the relationship that the bus should occupy in the transportation facilities as a whole, and, further, to apprise the community of the number and type of buses that our company has in service, which facts had not been presented adequately hitherto.

"Winning Friends for New Orleans," the next piece of copy, is strictly of the good-will type. Our company has always prided itself upon the courtesy of its car men, but we realize that local citizens think of this service as valuable only to the citizens of New Orleans. We have presented in the text another angle, which it was felt should cause a better appreciation of the value to the community of the courtesy of our car men.

While in the text of "A Forest Is Under the Track" we have had to deal to a large extent with figures, we believe that they have been handled in such a way as to be readable. This copy was written with the sole

idea of presenting the great difficulties encountered in operating a mass system of transportation on the congested streets of a great metropolis.

Analysis of the next public talk, "Transportation Builds School Houses and Homes," reveals that we have presented a value of street railway service, realized by all street railway operators and perhaps individuals actually engaged in the real estate business, but not generally appreciated by the average individual. The copy shows, too, the amount paid in taxes, without making any reference to the fact that a municipally owned utility pays no taxes, as it was thought that any direct reference to this fact might arouse a suspicion of some political issue in the offing, and thus tend to destroy the good-will value of this statement.

Little explanation is needed in regard to the text of "The City Is Judged by the Appearance of Its Street Cars." This company has always prided itself on the appearance of its street cars, but, of course, there being no local basis for contrast, the appearance of the street cars was taken as a matter of course. It was to awaken a realization of the influence that well-kept cars have on visitors, as well as the value of attractive street cars as they affect the general appearance of the city, that this copy was prepared. It should be noted that in practically all of these advertisements we reiterate our excellent records in safety and dependability.

"You Don't Deliver Your Own Mail" is perhaps nearer directly sales copy than any other advertisement carried in the series. It was written, however, first to reveal the high percentage of individuals who use street cars as contrasted with other means of travel, and, next, to awaken a consciousness of a mass system of transportation, just as the electric system is a mass system of power, and should be so considered.

The purpose of the last of the series, which is headed "Lost in Traffic Congestion \$1,500,000,000," was to apprise the community of the seriousness of traffic congestion, with the certainty that whatever should be done to relieve such congestion the street cars would be shown preference, and that whatever limitation was imposed upon the parking of automotive vehicles in the business section of the city would necessarily operate to the advantage of the street railway.

Allentown Has a Trolley "Greeter"

Employee of the Lehigh Valley Transit Company directs incoming railroad passengers to the proper cars for various destinations

HAVE you a "greeter" in your home town? Allentown has. Edward Greenawald, employed for 23 years by the Lehigh Valley Transit Company, has been given the position to welcome strangers at the two railroad stations in the town. Travelers, heretofore ignorant of the routes and destination names on the street car fronts, have been jumping in the taxicabs as the easiest thing to do. Now they ask the kind and courteous man standing there with the blue uniform and white cap which car they shall take. Thousands of dollars, the result of investigation, have been added to the coffers of the transit company since this new system has been in effect. E. C. Spring, general superintendent, said

that he was skeptical at the beginning and thought that nothing short of a crew of guides could ever get people into the cars.

On his way back to the station from the offices of the company, the inquiring reporter asked Mr. Greenawald a few questions:

"What time do you start, and what are your hours?"

"I get here at 7:30 in the morning," he replied. "I meet all the principal trains on both roads. As the passengers debark, I call to their attention that such and such a car is waiting outside. It is also my duty to learn if any trains are late; when I do, I hold the trolley at the station so that no one has to wait for his car. People appreciate this service very much."

"How has the taxi trade been recently?" was another question.

"Taxis are not carrying the passengers they used to.



Edward Greenawald, Allentown "greeter," assisting street car passengers

The taxi station over there," he pointed to the plaza where the cabs parked, "used to be filled. Now you see only two or three."

AIDS AS TRAFFIC OFFICER

Mr. Greenawald's job, however, is not only this. As representative of the transit company, he assists in keeping schedules by directing trolleys across the railroad tracks. There is always a halt to permit the conductor to cross the tracks and signal his motorman to proceed safely. With the inspector there, he gives the signal and many seconds are saved.

He must be an information bureau as well. Very often people want to know how to get to a small, nearby country town; how to get to a certain street number; ask where Larry "Whatsisname" is living; what time does the Bethlehem car pass; when will the Muhlenberg car reach Sixteenth and Hamilton Streets, and hundreds of other questions. Not only must he know Allentown's streets, buildings and people, he must be able to digest railroad time-tables and reel them off in a wink. He must help ladies on the trolleys. He must call off the names of the trolley destinations as the trains come in. He must smile at the little ones, and at the big ones, too. He must be on duty in fair weather and foul. He must hold cars for late trains. He must direct them across the railroads. He must be a human encyclopedia of everything that pertains to or is part of the Lehigh Valley Transit Company, with its many routes and its wide-flung system.

Maintenance Methods *and* Devices

Small Impregnating Tanks Favored

SMALL impregnating tanks are used by the London County Council Tramways, London, England, to supplement the one large impregnating tank with which its shop is equipped. The management, which is an extensive user of impregnation in motor repairs, believes this plan is preferable to the use of a few large tanks. There are fifteen small tanks, each of which will hold an armature. All are served by an overhead crane. It is the practice to leave an armature in one of these tanks for about six hours.



London County Council Tramways has fifteen impregnating tanks, each of which will hold an armature

Railroad Crossing Deraill for One-Man Cars

FIVE railroads are crossed at grade by the tracks of the Cleburne interurban division of the Northern Texas Traction Company, Fort Worth, Tex. At the time the interurban line was built the owners agreed to maintain derail switches on both sides of each railroad crossing, these derails to be kept open except when interurban cars were actually crossing the track.

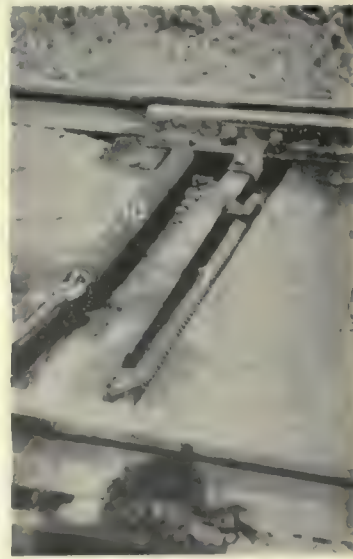
An arrangement of ordinary hand-operated derail switches served very well as long as the cars were operated by two men, but when one-man operation was begun the problem of operating the derail switches immedi-

ately presented itself. Full automatic operation, the company says in its 1927 Coffin brief, did not seem to be satisfactory as it did not require the operator to get out of his car and look up and down the track for an approaching train. Finally the company decided to use a derail which it developed itself. It consists of an ordinary hand-operated derail switch with an electric trip to open the derail after the car has passed. The details of the switch follow:

When the interurban car is approaching the railroad crossing the

switch point is open, as shown in the first illustration. Therefore, the operator has to bring his car to a full stop, get out and throw the switch lever so as to line up the switch point. Reference will now be made to the second view. When the switch point is lined up properly, a roller, 8, underneath latch 6 engages in a notch in plate 3 by the tension of spring 1. Plate 3 is bolted to the switch throw-rod. Latch 6 is pivoted at the point 2.

The car then proceeds to the contactor, which is mounted on the trolley wire 80 ft. beyond the switch



Northern Texas Traction develops derail for railroad crossings for use with one-man cars

point, as shown at 9 in the first view. On reaching the contactor, the trolley wheel or slide on the car completes a circuit through the magnet coil 5 in the second view. The plunger, 4, in this coil then trips latch 6. The switch point then comes to an open position through the action of spring 10 in the third view.

Cars coming through the switch point in the opposite direction cannot latch or keep the point lined up after passing it for two reasons: The first is that when the manually operated switch stand returns to the open position the handle automatically drops into a slot. The second reason is that as the car comes through the point, spring 7 acts in the ordinary way to return the point to the open position. The slot in the usual semaphore switch stand that holds the operating handle in closed position is filled up.

There are two of these equipments at each railway crossing and the company has had ten in service for some time with very satisfactory results.

Bearing and Gear Case Maintenance in Birmingham

SEVERAL ingenious maintenance methods of the Birmingham Electric Company are given in the 1927 Coffin Prize brief submitted by that company. Some of these have already been described in the Maintenance Data pages of other issues. Brief notes of some others follow:

Bronze bearings are now used for armature and axle bearings and are tinned by a rather novel device. After the bearings are heated in the gas furnace they are placed in a jig while hot, the tinning being applied by spinning the bearing around. This assures a smooth finish and even application of the tin to the interior surface of the bearing.

In the renewal of axle bearings it was quite frequently found that the axles were worn, and as it was customary to carry in stock bearings bored for a standard axle, they would not fit the worn axle. To overcome this trouble, axle bearings are only finished on the outside and rough-bored on the inside. A specially designed chuck was provided, so that now axle bearings are fitted to the individual axle to which they are applied. This has increased the life of the axle bearings 15 per cent and greatly reduced the noise of the car.

To overcome trouble in keeping gear cases on G.E.-57 and 67 motors tight, a 2½-in. x ⅝-in. wrought-iron

Loose armature "bands" render discordant music. Keep them keyed up tight and in tune.

strap was welded to the top of the gear case and the motor frame. This converted the type of support to a three-point suspension instead of two. This has reduced the maintenance of the gear cases on these types of motor by at least 50 per cent.

Much of the yarn waste used in carhouses for car journal packing is now reclaimed. The oiled waste is first heated to a temperature close to boiling, the mass being stirred meanwhile to remove all dirt. The reclaimed waste is stored in metal containers and the oil is piped to underground tanks. This practice has reduced the oil cost one-half and the waste annual consumption from 14,000 lb. to 5,000 lb.

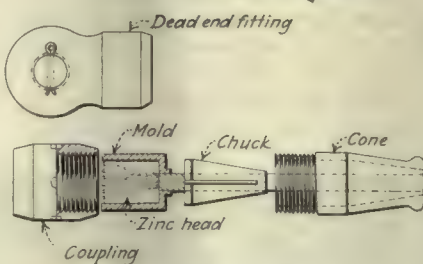
New Equipment Available

Improvements in Splice and Dead End

STRENGTH and ease of attaching are claimed for a new cable splice and dead end recently introduced by the Ohio Brass Company, Mansfield, Ohio. The cable splice consists of two cones and two chucks connected by a coupling, one threaded right



New cable splice



New dead end device

hand, the other left, with space provided for tightening with a spanner wrench.

The dead end is made up of a cone and a chuck with a clevis for connecting to dead end insulators. A zinc head molded on the end of the cable bears against the chuck and the strain on the cable pulls the chuck into the cone, compressing it on the cable and holding it in place firmly. The gripping action of the chuck increases with the tension. All strands of the cable bear their proportionate share of the load, because after the cone and the chuck are

slipped over the cable, the ends of the strands are spread and cleaned with emery cloth and tinned by dipping into molten zinc, with a flux of pure sal ammoniac. A mold is then clamped to the end of the cable and a zinc head is made which holds the ends of the strands and makes a positive electrical contact.

The device is made of high-strength, smoke-resisting bronze; it is more easily and quickly assembled because of fewer parts and because wrench surface on the cones and on the coupling is provided. Both the dead end and the splice are made in sizes to fit all cables from ½ in. to 1 in. diameter.

Combination Universal Saw and 8-In. Jointer

BY COMBINING a motor-on-arbor saw with an 8-in. jointer the Gallmeyer & Livingston Company, Grand Rapids, Mich., is offering a combination tool to the trade. Important construction and operating features of both machines are maintained. There is nothing to lock or unlock when changing from operating one machine to the other. When used as a jointer the saw is dropped to its lowest position and the slip coupling is moved to engage the coupling on the jointer.

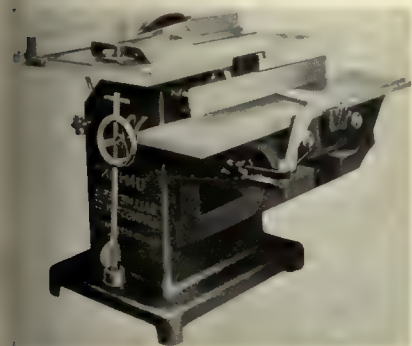
The motor develops sufficient power to rip 2½-in. stock at a satisfactory speed. The motor-on-arbor construction makes it possible to eliminate belts, gears or flexible couplings and provides a most efficient and positive drive.

The machine is mounted on a portable truck type base. Two rollers at the back and two stationary feet at the front of the base provide a firm setting on the floor when the machine is in operation. By pulling the handle forward to a position for moving

the machine a cam is raised, which in turn automatically lifts the feet from the floor and brings the weight of the machine on a third roller which is carried on a swivel bearing moving with the handle. This makes a convenient means of moving the machine from place to place as occasion demands.

The jointer tables are adjustable in height by means of small hand wheels under the ends. The machine will handle work up to 8 in. wide. The adjustment of the front table will allow a depth of cut to $\frac{1}{2}$ in. and a rabbeting groove in the rear table allows the cutting of rabbets up to the depth.

The fence can be set at any desired position on the front table. It is adjustable from any angle from 90 deg. to 45 deg. The 30-in. x 34-in. saw table is properly machined and can be tilted to any angle up to 45 deg. and instantly locked at the desired setting. It is an iron casting, stiff,



Motor-on-arbor type of universal saw and 8-in. jointer

will ribbed and similar to that supplied on high-grade machines. A dial with graduations and a pointer indicate the exact position of the table at all times. A stop is provided to facilitate a quick and accurate return to the horizontal position. A cross-cut gage can be used on either side of the saw, two slots in the table, one on either side, being arranged for this purpose. The ripping gage can also be used on either side of the saw. The tightening of the lever-head screw locks the ripping gage in position and lines it up automatically with the saw.

A saw guard protects the operator and fits down over the saw. It can be set instantly to allow any thickness of stock to be cut. A splitter guard is also part of the safety equipment. It keeps the stock from pinching the saw. A saw 12 in. in diameter is used which may be raised and lowered from flush with the table to high enough to cut 2 $\frac{1}{2}$ -in. stock.

Temperature Compensation Features Watt-Hour Meter



Portable watt-hour meter with temperature compensation features

SEVERAL advantages are claimed for a new type OB portable standard watt-hour meter which has recently been placed on the market by the Westinghouse Electric & Manufacturing Company. The outstanding improvement is the compensation for temperature errors at both unity power factor and low power factor, which is inherently permanent for both the electromagnets and the permanent magnets and does not depend on the movement of mechanical parts with the variation in temperature.

Superior accuracy is obtained along with a decrease in size and weight. The micrometer adjustments have been simplified and the electromagnets are of the one-piece OB type. A

zero reset is provided by which both pointers can be adjusted. Potential settings are changed by means of a small switch, and three current binding posts are used, so that the meter may be connected for either 1 or 10-amp. capacity.

New Automatic Non-Electrical Turnstile

"COINPASSOR" is the trade name given to the new automatic coin-controlled turnstile recently developed and put on the market by the Perey Manufacturing Company, Inc., New York, N. Y. The machine is non-electrical and therefore requires no wiring installation.

The important operating principle is the use which it makes of the coin or token. Instead of using the coin to operate some part of the mechanism, the "Coinpassor" makes the coin a part of the mechanism which the patron himself operates in passing through. The coin plays only a passive part in the operation of the turnstile, yet without the coin the mechanism is, in effect, incomplete and cannot operate.

The Brooklyn-Manhattan Transit Corporation, operating subways and elevated railways in New York City and Brooklyn, has given it a thorough trial, having installed 25 of them in its busiest stations, and reports that they have stood up satisfactorily with only routine attention. The machines have also been used by the Philadelphia Rapid Transit Company and the Public Service Railway of New Jersey.



Battery of Perey non-electrical turnstiles installed in B.-M. T. subway station

Association Activities

Problems of Commissioners Treated in Committee Reports

MOTOR vehicle transportation, public ownership and operation, grade crossings and public relations were the principal subjects covered by committees of the National Association of Railroad and Utilities Commissioners at their convention held at Dallas, Tex., Oct. 17 to 21. Each report covered an important phase of regulation of public utilities, bringing enlightenment on some particular problem of the commissioners.

MOTOR VEHICLE REGULATION

The report of the motor vehicle transportation committee stated that if regulation is to accomplish the best possible results it should be all inclusive. That is, all classes of operations must come under the purview of the law if it is to be made really effective and prevent discrimination, both in the matter of rates and charges and as between the various operators. It is quite obvious if the man operating between fixed termini and upon regular schedule, and who under these conditions must of necessity file tariffs and adhere thereto, is to be faced with the competition of unlicensed and unbridled operators who would take from him only the cream of the business paying the most profitable returns, that he will be in a very unprofitable condition.

The opposition to regulation evidenced on the part of the public in its early stages has largely disappeared. The public has come to a realization of the benefits of proper regulation, and that realization is reflected in the activities of enforcement officers.

Inability to accumulate accurate data over a considerable period of time reflecting the results of the operation of the motor vehicle in the public service is a handicap to regulatory authority in reaching scientific conclusions. The explanation of this is that apparently many operators have had little or no business training, and their volume of business is too small to warrant the expenses incident to the employment of skilled clerical forces. Another explanation is found in the fact that the federal government has not yet assumed supervision, and also that there has not always been helpful co-operation on the part of state and county peace officers in the strict enforcement of state laws, which, in the early stages of regulation, were not always popular.

Another of the difficulties confronting proper regulation is the activity of the fellow engaged in "private-contract" operations. Even some of those operat-

ing under permits between fixed termini and on regular schedules have asserted the right to handle this class of business. It is difficult to determine the dividing line between the common carrier and the man engaged under private contract by motor vehicle.

PUBLIC OWNERSHIP

Public operation of public utilities, asserted the public ownership and operation committee report, cuts deeply at the heart of our American system of business and government. Our system of private ownership and operation has been brought about by evolution based on ideas which permeated our whole life and methods of thought. In this country the development and conduct of our industries was wisely left to the initiative of private citizens, and our conception of the relation of government to business has been in the main the simple one that government existed merely to prevent the rights of activities of one man from encroaching upon the equal rights of another.

General management and supervision are found to suffer with public administration, and the period of service of public employees is generally brief, due to the fortunes of politics. The

reward of labor is generally less in public employ, and public officials too often find that they are bound by laws or practices that do not permit of the discretionary power that may be exercised in private employment. As a general thing, utilities owned and operated by the public furnish inferior service to that furnished by privately owned and operated utilities. They are on a lower level generally than the privately owned corporations, and as a rule they are slow in responding to new discoveries and new methods and often fail to supervise their equipment while discriminatory rates are as flagrant as they were prior to regulations in private plants.

All privately owned public utilities begin with systematic engineering plans of construction work, and there arises the first economy in favor of private operations. In organizing the staff to design and build, merit and efficiency alone are considered, and each man is selected and each move is made to secure the largest, quickest and safest return for the money expended. Political considerations do not enter.

Throughout the business world the best service is rendered when there is hope of reward, and the best commodity is produced when there is hope of profit. The losses due to extravagance and misdirected efforts of public operations of utilities will represent enormous dividends on properly applied capital and generally a plant can be built and operated at less cost by private capital than by public funds. All of these things, we believe, go to make public operations of public utilities undesirable.

Not agreeing with the views of the remainder of the committee on public ownership and operation, Joseph B. Eastman prepared a separate statement. He explained that these industries are very properly called, not private, but public utilities, and that public ownership and operation of utilities would not mean an entry by the government into the field of private business. Ownership and operation are different, he stated, and of the two operation is the more debatable. Public regulation is very necessary for private enterprise, he added.

PUBLIC RELATIONS

The committee on public relations in its report made three recommendations for the establishment of proper relations in the field of public utility service:

1. That the different utility companies faithfully and courteously fulfill all their assumed obligations to serve the public and consistently inform the public as a co-partner in business on all matters.
2. That the public, as a co-partner in the utility industry, should be enlightened by educational programs in schools.

COMING MEETINGS

OF

Electric Railway and Allied Associations

Nov. 2-3—Iowa Electric Railway Association, operating and maintenance sections, annual convention, Blackhawk Hotel, Davenport, Iowa.

Nov. 4—Metropolitan Section, American Electric Railway Association, Engineering Societies Building, 33 West 39th Street, New York, N. Y.

Nov. 4—American Institute Electrical Engineers, New York Section, Engineering Societies Building, New York City.

Nov. 17-18—American Society Mechanical Engineers, annual meeting, Engineering Societies Building, 29 West 39th Street, New York, N. Y.

Nov. 17-18—Personnel Research Federation, Accident Reduction section, 40 West 40th Street, New York, N. Y.

Jan. 26-27—Central Electric Railway Association, Cincinnati, Ohio.

by the public press, by lectures, and by general authentic publicity information on the fundamental principles pertaining to utility companies, their organization, operation, service, and regulation, and particularly as to the vital importance of financially sound utility companies and the individual and public importance of the service they render.

3. That regulatory commissions: (a) make every reasonable effort to impress upon utility companies coming under their jurisdiction the necessity of good public relations and their duty in maintaining such relations, to keep their officers honestly informed on all matters of legitimate personal interest in connection with their operation. (b) Give the public press all information of public interest pertaining to their duties and activities as regulatory bodies. (c) Co-operate as far as possible with the educational institutions of the state in an effort to establish a carefully prepared study of public utilities, public utility companies, and public utility regulation, in the public schools and colleges. (d) Conjoin with other commissions in establishing standard rules of practice and procedure wherever practical, and in co-ordinating the regulatory functions of the different state and federal commissions.

GRADE CROSSINGS

The safety of travel at grade crossings as measured by the mental attitude of the travelers was the conclusion of the committee on grade crossings and trespassing on railroads. The committee recommended that educational methods be employed to correct the mental attitude of the public and to promote observance of safety rules. It also recommended that grade crossings be eliminated wherever possible.

Iowa Association Announces Program

REDUCING operating costs of electric railway transportation without impairment of service will be the theme of the annual convention of the operators' section, Iowa Electric Railway Association, which will be held at the Blackhawk Hotel, Davenport, Iowa, on Nov. 2-3. The meetings will be led by chairman John Sutherland. Following is the program:

Wednesday Morning, Nov. 2

Welcome from Davenport, by Louis E. Cordell, Mayor.
"Some of the Problems Confronting the Electric Railways of Today and How They Have Been Met at Rockford, Ill.," by A. P. Lewis, general superintendent Rockford & Interurban Railway and Rockford City Traction Company.
"Shop Practices and Elimination of Equipment Failures," by Henry Cordell, master mechanic Chicago, North Shore & Milwaukee Railroad.

Wednesday Afternoon

A tour of inspection of railway properties in the Tri-Cities, including the repairs in Rock Island, arranged through the courtesy of the Tri-City Railway.

Wednesday Evening

Annual convention banquet.

Thursday Morning

"Making the Most of Motor Coach Popularity in Bringing Back Riders," by D. D. Bentzinger, assistant to general manager Iowa Southern Utilities Company, Centerville, Iowa.

"The Importance of Freight Business in Building Interurban Revenues," by C. F. Doge, general superintendent Clinton, Davenport & Muscatine Railway.

"Co-ordination of Motor Coaches and Street Cars and Operation and Maintenance of Both," by A. H. Smith, superintendent Dubuque Electric Company.

Thursday Afternoon

"Track Construction and Maintenance," by W. L. Wilson, civil engineer Des Moines City Railway.

"The Automatic Treadle Door and Its Relation to the Modern Car," by R. S. Frehse, sales engineer National Pneumatic Company.

"The Gas-Electric Drive for Motor Coach Operation," by W. A. Clough, engineer General Electric Company.

A.I.E.E. to Discuss City Growth

"PREDICTING the Future for New York" is the subject for the next meeting of the New York Section of the A.I.E.E., to be held on Nov. 4. The following papers will be presented:

"Probable Growth of New York City and Distribution of Population," by E. P. Goodrich, consulting engineer on city planning for the Sage Foundation.

"Architectural Requirements and Building Service," by R. H. Shreve, president New York Building Congress.

"Suburban Transportation," by L. S. Miller, president New York, Westchester & Boston Railway.

"Urban Transportation," by C. E. Smith, consulting engineer.

"Telephone Service," by J. S. McCullough, president New York Telephone Company.

"Light and Power Service," by J. W. Lieb, vice-president and general manager New York Edison Company.

American Association News

Engineers' Standing Committees Announced

STANDING committees of the Engineering Association on power, purchases and stores, rolling stock, and way and structures have been completed. These are the continuing committees which have charge of the activities of the four principal divisions of the association's committee work. The personnel follows:

POWER

W. E. BRYAN, superintendent of power United Railways of St. Louis, St. Louis, Mo., chairman.

W. H. BASSETT, Waterbury, Conn.
L. W. BIRCH, Mansfield, Ohio.
C. A. BUTCHER, East Pittsburgh, Pa.
M. W. COOKE, Pittsburgh, Pa.
H. A. KIDDER, New York, N. Y.
JOHN LEISERNG, Springfield, Ill.
J. F. NEILD, Toronto, Ont., Canada.
F. W. PETERS, Schenectady, N. Y.
W. J. QUINN, New York, N. Y.
D. L. SMITH, Chicago, Ill.
L. J. TURLEY, Los Angeles, Cal.

PURCHASES AND STORES

JOHN Y. BAYLISS, director of purchases and supplies Virginia Electric & Power Company, Richmond, Va., chairman.

A. S. DUNCAN, East Pittsburgh, Pa.
A. L. FISHER, Cincinnati, Ohio.
J. FLEMING, Washington, D. C.
B. W. FORKNER, Mansfield, Ohio.
A. E. HATTON, Pittsburgh, Pa.
F. A. JORDAN, Atlanta, Ga.
E. A. MURPHY, Indianapolis, Ind.
A. A. ORDWAY, Boston, Mass.
W. E. SCOTT, Philadelphia, Pa.
C. THORBURN, Los Angeles, Cal.
W. J. WALKER, Schenectady, N. Y.

ROLLING STOCK

A. T. CLARK, superintendent rolling stock and shops United Railways &

Electric Company of Baltimore, Baltimore, Md., chairman.

R. S. BULL, superintendent of equipment Pittsburgh Railways, Pittsburgh, Pa., vice-chairman.

V. W. BERRY, Richmond, Va.
C. BETHEL, East Pittsburgh, Pa.
W. C. BOLT, Chelsea, Mass.
J. M. BOSENBURY, Springfield, Ill.
J. A. BROOKS, Philadelphia, Pa.
M. R. HANNA, Schenectady, N. Y.
J. S. MCWHIRTER, New York, N. Y.
A. D. MCWHORTER, Memphis, Tenn.
T. H. NICHOLL, Anderson, Ind.
R. B. SMYTH, Boston, Mass.

WAY AND STRUCTURES

H. H. GEORGE, assistant to chief engineer Public Service Production Company, Newark, N. J., chairman.

E. M. T. RYDER, way engineer Third Avenue Railway System, New York, N. Y., vice-chairman.

C. A. ALDEN, Steelton, Pa.
C. H. CLARK, Cleveland, Ohio.
E. B. ENTWISLE, Johnstown, Pa.
C. L. HAWKINS, St. Louis, Mo.
W. G. HULBERT, Easton, Pa.
J. R. MCKAY, Fort Wayne, Ind.
C. A. SMITH, Atlanta, Ga.
A. T. SPENCER, Montreal, Quebec, Canada.
H. M. STEWARD, Boston, Mass.
J. H. SUNDMAKER, Cincinnati, Ohio.
F. B. WALKER, Boston, Mass.

"Met" Section Meetings Announced

MEETINGS for the current season of the Metropolitan Section, A.E.R.A., are scheduled as follows: Nov. 4 and Dec. 2, 1927; Jan. 6, Feb. 3, March 2, April 6, and May 4, 1928. The hour and place of each meeting will be announced as arrangements are completed.

News of the Industry

Piedmont Renews Its Application

Charles Evans Hughes has been engaged as counsel by the Piedmont & Northern Railway in its effort to get permission from the Interstate Commerce Commission to extend these lines.

The road filed exceptions with the commission on Oct. 25 to a proposed report by Examiner Haskell Davis refusing to permit the extensions on the ground, among other things, that they would parallel for a long distance the Southern Railway and are not needed. Other exceptions were filed by Governor Richards of South Carolina and several municipalities and civic organizations which favor the extensions.

The Piedmont & Northern claims that its original purpose was to extend its lines as an interurban electric road but that World War conditions interfered with its program.

The Southern Railway, in earlier proceedings, declared if the application is granted its annual earnings will be lessened by \$10,000,000. Other steam roads aligned against the granting of the application of the electric railway are the Seaboard Air Line, Atlantic Coast Line and the Clinchfield.

Ten Cents in Beacon

An increase in fare in two operating zones from 7 cents to 10 cents with three tickets for 25 cents was permitted the Fishkill Electric Railway, Beacon, N. Y., by the Public Service Commission in an order dated Oct. 20. The company was also authorized to increase its 54-trip \$5.40 commutation ticket rate to \$6. There will be no change in school children's tickets.

The value of the property used in giving service was placed at \$246,719. After payment of interest charges and amortization there would be available \$5,885 for dividends and extraordinary expenses. Commissioner Van Namee's memorandum stated that the latter amount would hardly be realized and that it was apparent that any increase in revenue which might be obtained from the new rate would not suffice for a reasonable return upon the property used in giving service.

The railway has been in operation since 1892.

Columbians Awakened to Need of Better Transportation

Sentiment which scores the 10-cent jitney and a crippled bus system in Columbia, S. C., is rapidly crystallizing in favor of the street car which deserted the streets of the city last March. Now in the hands of the Supreme Court is the action of the Attorney-General of

the state seeking a mandamus to enforce the resumption of street car service. Railway service was formerly supplied by the Columbia Railway, Gas & Electric Company.

In a recent editorial, the leading daily of Columbia, the *State*, takes the position that unless better transportation be provided growth will be hampered and even very seriously retarded. Where is there a town of 100,000 inhabitants

without railway service, says this writer who states that it is almost inconceivable that a town could grow to such size under the heavy handicap imposed by deprivation of electric railway service. Bungling over the "transportation situation" is charged with a net result that cars are not in operation, buses and jitneys are not prospering and the public is dissatisfied. "Think it over, gentlemen—all of you."

Thomas N. McCarter Honored

Employees of New Jersey company surprise their president on occasion of the 60th anniversary of his birthday. Stock-selling campaign huge success



Thomas N. McCarter

ABOUT 1,000 employees of the Public Service Corporation of New Jersey assembled in the auditorium of the Newark Terminal Building on the morning of Oct. 20 to participate in the ceremonies attendant on the awarding of trophies and prizes in connection with the recent 6 per cent cumulative preferred stock campaign, in which 115,226 shares were sold to 15,492 subscribers.

At the conclusion of the trophy ceremonies, the meeting was turned into a birthday party in honor of the 60th birthday anniversary of President Thomas N. McCarter. A huge bunch of American beauty roses was presented to the president by John Craig, Rutherford, one of the oldest employees in any of the companies. Mr. Craig is 69 years old and has a service record of 35 years. He is employed at the Kearney electric generating station.

As the president rose to speak, the chair in which he was seated during the presentations was transformed to represent a huge birthday cake. Sixty large electric globes were set on a white table with the Public Service emblem in the background.

Six grand prizes and six trophies presented by the president and vice presidents, were awarded for the large number of shares sold and for the greatest number of subscribers to the stock.

At the conclusion of the presentation of these awards President McCarter thanked the whole Public Service organization for its splendid work in the campaign.

The grand prize winners were: First, \$150, William T. Blackwell, Newark general lighting representative; second, \$125, Timothy J. Fields, Paterson, instructor, railway; third, \$100, A. Hebbe, foreman, Newark Railway Shops; fourth, \$75, Miss Annie Morris, combination representative, Burlington commercial office; fifth, \$50, George S. Curtis, Paterson, Passaic Division superintendent of electric distribution; sixth, \$25, Walter Johnson, assistant cashier, Trenton commercial office.

The trophies were silver cups and were awarded as follows: The president's trophy to the Southern Division Vice-President R. R. Young, in charge of sales, presented his trophy to the commercial department, Southern Division; Vice-President Edgar Allegaert, the electric department, to the Essex Division; Vice-President John Clark of the gas department, to the Bergen Division; Vice-President Matthew R. Boylan of the railway transportation companies, to the Southern Division; Vice-President N. Carle of the Production Company, the electrical engineering department; Vice-President P. S. Young, in charge of finance, to the general office group.

Draft of Indeterminate Permit Bill Presented

Let of traction enabling bills is received by Chicago City Council sub-committee. Realtors condemn indeterminate permit plan of companies. Municipal ownership advocates active

COMPLETING the work of preparing five legislative bills to be used as a basis for settling Chicago's traction problem, James Breen, assistant corporation counsel, has turned over to the City Council's sub-committee on local transportation a tentative draft of a new indeterminate permit bill. Four bills dealing with subway construction, consolidation, a local transit commission and repeal of the twenty-year limit on electric railway franchises have previously been accepted and approved by the sub-committee.

As interpreted by the city attorney, the indeterminate measure, which is regarded by the companies as the most valuable of all to the solution of the problem, allows the city the option of granting either a fixed-term franchise or one without time limit. The bill introduced into the Legislature last spring by the companies provided for an indeterminate franchise only.

A final meeting of the sub-committee to approve and recommend to the full committee on local transportation the entire set of bills will be held on Nov. 2.

Sharp criticism of the indeterminate plan as proposed by the companies was voiced during the week ended Oct. 22 by several speakers at a meeting of the Cook County Real Estate Board. Edward W. Bemis, consulting engineer, urged the realtors to support either the Lisman or the Detroit purchase plan as the only practical measures which have so far been presented to the City Council. This proposal to grant indeterminate permits, he contended, would give the present companies complete and perpetual control of the city's transit facilities.

Although he had no specific scheme to submit, Carl D. Thompson, secretary of the Public Ownership League of America, who was another speaker, suggested that acceptance of the plan presented by executives of the surface and elevated line systems would absolutely preclude any chance of the city to own its local transportation systems.

Under the Lisman ordinance, now pending in the City Council and outlined previously in the *ELECTRIC RAILWAY JOURNAL*, the City Council would give to the New York banking syndicate headed by Frederick J. Lisman a railway franchise for twenty years and renewal for ten years more, after which the entire surface lines system would be turned over to the city for \$1. The Detroit purchase plan was proposed to the City Council several months ago as means of negotiating purchase of the car lines by the city and is based on methods said to be

successfully employed by the city of Detroit.

Local municipal ownership advocates, headed by Attorney Henry M. Ashton, have begun circulating a petition asking for a referendum next April on the question of supplanting the present private railway operations with a large system of municipally owned and operated motor coaches. If they succeed in getting the necessary 125,000 signatures, or 25 per cent of all registered, the following questions will be placed upon the ballot at the spring election:

1. Shall the city of Chicago proceed at once to motorize its entire surface lines transportation by purchasing 4,400 pneumatic-tired buses and equipment out of the

\$55,000,000 now in the city traction fund?

2. Shall the city of Chicago proceed to operate buses?

3. Shall the city of Chicago refuse to grant any permit or franchise giving the Chicago Surface Lines or any other private corporation the right to operate street cars in the streets of Chicago?

Coincident with the announcement of the municipal ownership petition, Corporation Counsel Samuel Ettleson handed down a rule which again defeats proposals to borrow money from the city traction fund, a sum which has been accumulated by street car riders during the period of the twenty-year franchise granted to the Chicago Surface Lines in 1907.

The decision was rendered in connection with the request of the City Comptroller to be allowed to borrow money from this fund to tide the city government over until this year's taxes are received and to give city bonds as security. Mr. Ettleson held, however, that the city might sell bonds to the traction fund up to the \$15,000,000 maximum allowed by the traction fund laws.

McGraw-Hill and A. W. Shaw Companies Form Subsidiary

Four national circulation industrial publications affected by publishing plan which will combine them into two monthly papers

INCORPORATION of a subsidiary to publish four long-established national circulation industrial publications just acquired was announced on Oct. 26 by the McGraw-Hill Publishing Company, Inc., New York, and the A. W. Shaw Company, Chicago. The subsidiary is the McGraw-Shaw Company and the papers affected are *Factory*, *Industrial Management*, *Industry Illustrated* and *Industrial Engineering*. Under the announced publishing plan, the first two papers will be combined as *Factory and Industrial Management*, starting with the January issue. The third paper will be consolidated with *Industrial Engineering*, a McGraw-Hill publication, starting with the December issue.

Facts underlying the formation of the subsidiary were outlined in a statement by James H. McGraw, president of the McGraw-Hill Publishing Company, Inc., and in a letter sent to advertisers in the affected papers by A. P. Gumaer, as manager of *Industrial Engineering*, with which is consolidated *Industry Illustrated*, and by James O. Peck, as manager of *Factory and Industrial Management*.

The statement by Mr. McGraw stressed the fact that the arrangement by which the two parent companies control jointly a subsidiary publishing important publications devoted to industry is in no sense or degree a merger of the McGraw-Hill and Shaw groups of journals. He pointed out that the two companies have effected

a separate subsidiary organization to serve more adequately in a publishing way those manufacturers whose broad marketing problems extend throughout the range of industry.

LETTER GIVES FACTS

The letter from the two publication managers gives the details of the reasons for the latest announced development in the field of business paper publishing.

The communication addressed to advertisers says:

Believing that you will be greatly interested in a publishing move for better marketing we want you to know of plans to intensify the service value of several papers with which you are familiar—*Factory*, *Industrial Management*, *Industrial Engineering* and *Industry Illustrated*.

Two consolidations have been made and plans are being put into effect to add materially to the strength of their editorial, circulation and advertising functions.

To carry out this program, the McGraw-Hill Publishing Company, Inc., and the A. W. Shaw Company have formed a subsidiary publishing company known as the McGraw-Shaw Company. No change has been made, however, in the corporate status of the parent companies. *Factory*, heretofore published by the A. W. Shaw Company, and *Industrial Management*, recently acquired by the McGraw-Hill Publishing Company, will appear in January as one publication under the name of *Factory and Industrial Management*.

Industrial Engineering, heretofore published by the McGraw-Hill Publishing

Company, and *Industry Illustrated*, recently acquired, will appear in December under the name *Industrial Engineering*, with which is consolidated *Industry Illustrated*.

While these consolidated publications will retain their original fields it is the aim of the McGraw-Shaw Company, through far-sighted industrial journalism, to keep a step ahead of the changing production needs of industry, whether those needs are influenced by management, finance, engineering, production or marketing.

Factory and Industrial Management will serve the top production executives in problems of production management and policy. *Industrial Engineering*, with which

is consolidated *Industry Illustrated*, will deal with all phases of plant services—mechanical, electrical, or otherwise—through which production is attained.

The letter concludes:

Seldom have publishers had the opportunity to offer a more tangible service to industry or to individual manufacturers. Details of the plan will show how manufacturers can do a more economical and efficient job of advertising and selling.

James H. McGraw is chairman of the board of the McGraw-Shaw Company. A. W. Shaw is president.

Holyoke Decision Significant

Massachusetts regulatory body insists railway shall be permitted to charge rates which under reasonably prudent and economical management will yield a fair return

UNUSUAL interest attaches to the decision by the Massachusetts Department of Public Utilities to permit the Holyoke Street Railway to increase its rate of fares. The schedule is a modification of the one the company filed, but is intended to enable the company to maintain the quotation of its stock at par. The commission filed a long decision which outlines the financial policy to be followed in Massachusetts in regard to railway fares.

The matter can be understood intelligently only by the recital of some of the recent events in connection with the case. On Aug. 1, 1927, the company filed tariffs with the commission to become effective on Aug. 31. These tariffs were intended to provide for an increase in the regular rates of cash fares from 6 cents to 10 cents, with a provision for the sale of four tickets for 30 cents, good for a ride in any one fare zone. They also provide for certain overlaps, for a ride from any part of the central zone, called Section A, to any other part, by the use of transfers when necessary, upon the payment of a 10-cent cash fare, for special tickets between various parts of the system when sold in strips varying from four to five, and for an increase in pupils' tickets from 3 cents to 5 cents when sold in strips of ten.

The date the rates were to go into effect was suspended from time to time, the last suspension being until Oct. 22.

In view of the public interest and discussion which has taken place in this matter, the commission prefaced its consideration of the subject with a few fundamental principles sometimes lost to sight in the heat of advocacy. In this connection the state body said:

General Laws of Massachusetts, Chapter 159, section 14, requires this department, before it sets aside rates fixed by a carrier, to determine that the same are unjust and unreasonable, and also requires that, if the department shall be of such opinion, it shall determine the just and reasonable rates to be charged for the service to be performed. Where the question

involved is not one of specific rates, but as here, of the whole rate structure of the company, this department is bound to follow the interpretation which has been given to this and similar statutes by the courts of this Commonwealth. There can be no doubt that this statute, which of course is mandatory upon us, interpreted in the light of these decisions, obliges us to permit the carrier to charge such rates as will give it a fair return upon the capital employed in the undertaking. We must perforce, therefore, approach this question in that view of the law. Apart from any question of law, we think it obvious that a public utility ought to be allowed rates under which reasonably prudent and economical management will yield a return upon the capital employed in the enterprise sufficient to enable it to sell its shares of stock.

Under the laws of the Commonwealth a street railway is obliged to sell its stock at par or not at all. Any policy, therefore, which results in a failure to maintain the value of its stock at par cripples its ability to meet the needs of the community, impairs its credit and, if long continued, results in financial disaster to the company and great inconvenience to the public. So long as the dividends paid on the capital stock of the company are only such as are necessary under prudent management to maintain the credit of the company and its ability to obtain new capital needed in its development, the interests of the company and its passengers are substantially identical. Adequate service cannot be given unless the passengers pay that which is necessary to provide the same.

The capital of the company consists of \$1,342,000 of common stock, on which a premium of \$276,160 was paid into the treasury of the company. The request of the company was that it be permitted to charge rates sufficient to yield a return of 6 per cent upon its investment. During the last seven years the company paid dividends of 6 per cent on its capital stock. This really was equivalent to only 4.98 per cent on the stock and premiums. In the last two years, at least, the company did not, in the opinion of the commission, make sufficient provision for depreciation, an operating expense necessary and proper to be charged against earnings. While

the railway paid a dividend of 6 per cent in 1926, it actually earned only 4.17 per cent on its stock and premiums. For the first six months of this year its passenger revenue was \$24,000 less than for the similar period last year, and up to the present no dividend has been paid this year. Its passenger revenue in 1926 was \$188,000 less than in 1920 and 3,000,000 fewer passengers were carried in 1926 than in 1920, in spite of the fact that in the year 1926 the company operated 112,000 more passenger car-miles and 11,500 more passenger car-hours than in 1920. If there had been no falling off in the number of passengers carried in 1926, as contrasted with 1920, the company would have received additional revenue under its existing fares equivalent to the proposed increases. It was generally conceded by all at the hearings that the company had been and is giving good service to its patrons and that it has been and is well managed.

The company contended that to earn a net return of 6 per cent on its invested capital, on the basis of last year's earnings and of the first six months of this year, it would need \$207,646 additional gross revenue. Based on its own experience and that of other companies, it estimated that the proposed schedule would yield an additional revenue of about \$173,006. No reliable evidence was offered to refute this estimate, and, based on the experience of other railways that have increased their fares, the commission did not think that this estimate was excessive. To the contention by Holyoke people of discrimination against them, the commission said:

We feel that the company should permit passengers to ride from any part of Section H to any part of Section G, and vice versa, upon the payment of a 10-cent cash fare, issuing transfers therefor, and thus place riders in Chicopee substantially upon a parity with riders in Holyoke. If this should be done, we believe that there would not be any unfair or unjust discrimination.

In concluding its decision the commission said:

The proposed schedule provides for the sale of pupils' tickets in strips of ten for 50 cents, each ticket good for one ride in each fare zone. This requires pupils to pay 5 cents for a ride which costs regular patrons 7½ cents. We are of the opinion that pupils' tickets should be issued in strips of ten for 38 cents, to be sold in the manner prescribed in the schedule, each ticket to be good for one ride in each zone or section where a 7½-cent ticket enables a passenger to ride and that pupils' tickets should be sold in strips of ten for 50 cents, each ticket to be good for one ride between points where a 10-cent ticket or a 10-cent cash fare enables a passenger to ride.

When the tariff is amended in accordance with the changes above set forth, we think it should be allowed to go into effect. Accordingly, it is ordered that the tariff filed by the Holyoke Street Railway on Aug. 1, 1927, be canceled, with leave to the company to file an amended tariff carrying out the changes above outlined, and, upon such an amended tariff being filed, it shall become effective forthwith.

Action on Omaha Franchise on Oct. 31

The City Council of Omaha, Neb., has finished its consideration of the draft of the new franchise for the Omaha & Council Bluffs Street Railway and will take final action on it on Oct. 31. In the meanwhile the officers and attorneys for the company are considering the draft, with the expectation of entering objections to several of its provisions. As the draft now stands it calls for a special election on Jan. 10, 1928. In this draft the Council has sought to meet the various objections urged by voters at the election where the company's draft was defeated last year.

One Dollar Weekly Pass for St. Petersburg

Weekly passes on the line of the Municipal Railways, St. Petersburg, Fla., will be put in force about Nov. 1. The passes will sell for \$1. While the pass will be accepted on all railway lines in the city, it cannot be used on the buses. It was also made clear that passes could not be used by school children as the city gave these patrons the benefit of a 5-cent fare with transfer privileges from car to bus or from bus to car. The weekly pass was decided upon especially for those who live in the outlying districts and who use the cars regularly in going to and from their work. Persons making four trips a day on the street car will be able to save 40 cents a week by using the pass. Regular fares for seven days on four trips a day would amount to \$1.96.

Franchises Sought by Key System

The Key System Transit Company, Oakland, Cal., has applied to the City Council of Richmond for 50-year franchises for all its lines in Richmond. Application followed a recent agreement at the company would maintain local car service if the long-term franchises were authorized. Several franchise grants are near expiration.

Electrification Planned of Reading Suburban Lines

Plans are being prepared, it is said, for the electrification of suburban lines of the Reading Railroad, Philadelphia. Work will start on the Chestnut Hill branch next year and the work completed in about two years. Electrification of the lines to Glenside and Langhorne will probably follow and the cost of electrifying the three lines will be \$10,000,000 to \$12,000,000. Electrifying the Chestnut Hill branch will cost between \$4,000,000 and \$5,000,000, including the company's share of the cost of removing a number of grade crossings. Included in cost is the expense of electrifying the Reading Terminal at Twelfth and Market Streets in Philadelphia.

The company has placed orders for 35,500 tons of 130-lb. steel rails for 1928 delivery, which is about the same as last year, when 36,000 tons were ordered for 1927 road work. It is well supplied with steam equipment and no additions are contemplated.

As Things Are and as They Were in Altoona

Progress week in Altoona, Pa., which opened Oct. 25, is being participated in by the Altoona & Logan Valley Electric Railway, through a display arranged by the Altoona Chamber of Commerce. Large windows in the center of the business district were given over to the railway and in them is pictured a likeness of the newest in rolling stock owned by the company, together with the "standard" cars of 1900 and a picture of the first car ever operated in Altoona, a horse-drawn one.

Artistic Effect Important Consideration in Jamestown

The color scheme for cars most popular in the voting contest has been adopted by the Jamestown, Westfield & Northwestern Railroad, Jamestown, N. Y. When the company purchased six new cars it asked the citizens to select the color for the equipment. The suggestion was first advanced by one of the company's department heads, who proposed that the cars be painted the colors of the city's three junior high schools, with a voting contest to choose the most popular combination.

Three cars were painted desert sand, deep cream, pyramid gray and fire red for Lincoln Junior high school; azure blue, deep cream, sage green, blue and fire red for Washington Junior high school, and pigskin, romany maroon, deep cream, fire red and gray for Jefferson Junior high school. The cars bore the pennant of the school represented. After a three-day contest, the Lincoln Junior high school combination, with a total of 463 votes, received the highest number of the 804 cast.

W. H. Pickard, traffic manager, said that the number of votes cast showed that the people were really interested in how the cars were painted, so that when the order for the new cars was placed the desired color scheme was adopted with slight modifications.

Ohio Fare Increase Turned Down

Stark County Commissioners rejected the request of the Northern Ohio Power & Light Company to increase the fare between Canton and Massillon, Ohio, from 15 cents to 25 cents. Other pleas for increased passenger rates were also turned down. As a result of the denial H. D. Berkaw, company superintendent, said that the case would be taken to the Public Utilities Commission. In its petition the company claimed that the present fare did not meet the operating expenses of the 8-mile line, which recently had been double-tracked.

School and Shut-in Children Have Own Car in San Francisco

Operation of a new parlor car for the use of children, principally for educational purposes, without charge, and also for the unprivileged and shut-in children, has been announced by Samuel Kahn, president of the Market Street Railway, San Francisco, Cal. The car is finished in white enamel, trimmed with gold, and fitted with all the latest safety appliances. The end sections boast of the latest type leather-upholstered seats. Thick carpet covers the floor of the center section, which has plush-cushioned wicker chairs and heavy plush window drapes.

Many trips are already scheduled to take technical classes of the San Francisco public and parochial schools to the company's car-building plant, the car operators' training room and one of the latest substations. T. A. Bragg, in charge of employment and training for the company, is acting as guide to the school classes. Technically trained men explain the mechanical and electrical processes in the various departments as the classes watch the inside workings of the big machines necessary to successful railway operation.

When schedules will permit, the car is to be devoted to unprivileged and shut-in children who need to get around and without some such service as this might not have an opportunity.

Louisville Carhouse Is Victim of Bandits

Masked bandits invaded the carhouse of the Louisville Railway, Louisville, Ky., on Oct. 16 and escaped with \$1,300 in cash and \$200 in car checks after forcing four employees to lie prone on the floor. Employees claim that the robbers had timed their visit, and had also learned just where the money was kept. However, a large safe containing \$1,500 and boxes holding 84 coin containers from street cars, not yet emptied, were ignored.

Public Utility Courses in Illinois University Work

The School of Commerce of Northwestern University is conducting afternoon and evening courses in public utilities in Wieboldt Hall, Chicago, during the 1927-28 semester. These emphasize the economic, financial, legal and managerial principles in effective operation and management. This curriculum was established in recognition of the ever-increasing importance of the functions performed in modern industrial society by public utilities.

The University of Illinois is also offering a course in Economics of Public Utilities, through its College of Commerce and Business Administration. The courses on operation of public utilities, management of public utilities, public utility administration and other phases are open to graduates as well as advanced undergraduates.

W. D. Mahon Warns of Dangers in Highly Competitive Business

The danger in bus and private automobile competition should arouse electric railway managements to the necessity of improving their services, in the opinion of W. D. Mahon, president of the Amalgamated Association. In a recent statement on present-day conditions he is reported to have said:

In the first place it would pay stockholders in these properties to reflect that the chief problems of management in the past have had to do with politics, economical operation and rate making. The business has been characterized by monopolistic conditions. "Ride the cars or stay at home," represented the laconic attitude toward development of business. Management must be jarred out of this state of mind if the street car industry is to prosper.

There will always be a use for street cars and a use for buses. Henry Ford once said, in discussing the street car problem, that nothing that ever came into the world and proved its usefulness had ever gone out of it. This union includes bus drivers as well as street car operatives, so it cannot be charged that our views are inspired by selfish interests.

The need of the moment is for intelligent efforts to improve street car service. Better cars should be provided. Comfort and speed should be sought. Plenty of new business remains to be developed. Automobile owners—many thousands of them—can be won back to street car riding if it is made more comfortable and more expeditious. The expense of motoring and the difficulties of parking would cause owners of cars to ride the trolley to business if they had not learned to despise the creeping rattlers that many companies operate.

One-Man Cars in Smaller Streets of Montreal

By decision of the City Council the way has been left open for the continued use of one-man trams in Montreal, Canada, in the smaller streets of the city, but not in the large thoroughfares. The question came before the Aldermen in the form of a report submitted by a committee suggesting that the use of these cars be prohibited in Montreal. A minority report recommended that the cars be given further trial. After a debate the Council decided the public interest would be best served by not taking a decisive stand against these tram vehicles in all city streets, and a motion was accepted in that sense.

Fatal Accident on Indiana Interurban

Eighteen persons were reported as injured on Oct. 14 when a car of the Union Traction Company of Indiana, Anderson, Ind., struck a truck trailer carrying a score of persons to a lodge dance at Emerson Avenue and the Honeybee line on the outskirts of the city of Indianapolis. A separate investigation of the accident has been ordered by the Indiana Public Service Commis-

sion. The conductor and motorman of the interurban, both of whom were injured and sent to the hospital, have been placed under arrest and released on \$2,500 bond. The driver of the truck, who was not injured, also was placed under arrest and held under a similar bond. The truck had passed over the track, but the trailer was squarely in the middle of the interurban line when the inbound car collided with it.

Resumption of New Jersey Line Sought

Residents of National Park, N. J., have presented a petition to the Borough Council demanding resumption of railway service from there to Camden and Woodbury, discontinued some time ago because of the building of a bridge over Big Timber Creek. The line is operated by the Public Service Railway.

Foreign News

Good Year for Brazilian Traction

Net earnings of the Brazilian Traction, Light & Power Company for the year ended Dec. 31, 1926, totaled \$12,278,654, compared with \$8,848,594 the previous year. Comparison of the balance sheet with the figures of previous years showed remarkable growth. In 1922 the property account stood at \$94,301,954. In 1926 it stood at \$140,701,014. In 1922 total assets were \$250,685,074. In 1926 this item stood at \$286,104,734. Total assets have not grown as rapidly as property account. The reason lies in the policy of writing off large amounts for depreciation. Reserves which were \$52,481,431 in 1922 have grown to \$83,896,762. The Brazilian Company itself has no funded debt, the items which total \$67,692,707 being the bonds of subsidiaries such as the Rio Tramways and São Paulo Electric Company. Sir Alexander MacKenzie, president of Brazilian and subsidiary companies, says in his report that Rio de Janeiro and São Paulo, the two principal cities which the company serves with transportation, electricity for heat and for power, have become the two principal industrial centers of South America, largely by reason of their abundance of cheap power and other modern facilities.

Proposed Co-ordination of London Passenger Services

The Automobile Association is carefully studying the proposed extension of the present London Traffic Combine to include under one management all the passenger services of the metropolis, including railways, omnibuses and tramway systems.

Considerable publicity has already been given to the advantages of the scheme as viewed from the standpoint of those whose interests are directly concerned in the furtherance of this project, but the Automobile Association takes the view that there is another angle from which these proposals have yet to be carefully analyzed.

In the absence of full particulars of this new "grouping" scheme, it is obviously impossible to express any definite opinions, but should a legislation be introduced to give effect to the scheme as at present outlined, the Automobile

Association will thoroughly examine the proposals and, through the medium of the motor legislation committee, take such action as may be necessary to safeguard the interests of the owners of private motor vehicles.

New Swiss Electrically Operated Cable Railway

Work has commenced on the construction of a new electrically operated cable railway between Lake Traub and Gerschnialp, near Engelberg, Switzerland. The line is being constructed on the Bleichert system. The difference in altitude between the upper and lower stations is about 6,560 ft., which it is expected will be covered in ten minutes.

Electrification Extended by Mexican Railway

Officials of the Mexican Railway, Ltd., have completed arrangements for the extension of the electric zone now operating over the Maltrata Incline eastward to Paso del Macho, a distance of about 22 miles. The most difficult portion of this grade section was converted to electrical operation in the latter part of 1924, and during the past year an additional 17 miles, fed from the single original substation, was placed in service.

Extension now under way will require an additional substation, which will be located at Portrero, a short distance east of Cordoba. Equipment for this extension will be supplied by the International General Electric Company. It includes line material and bonding and a complete 3,000-kw. substation, to contain two 1,500-kw., 3,000-volt synchronous motor-generator sets with transformers, switchboards and switching equipment. This station will be a duplicate of the present substation except in capacity.

When this extension is completed there will be a total of about 70 miles of electrified track running through the severest grade section of the line between Mexico City and Vera Cruz. Grades run as high as 5.25 per cent maximum, with an average of 4.7 per cent for about 25 miles. The remainder of the electric

one ranges from 2 to 3 per cent. All trains on these grades will be handled with regenerative electric braking and it is expected that the same 150-ton locomotives used on the original electric line will be used on the extension.

Power is to be supplied over a new transmission line from the Toxpango power plant of the Puebla Tramway, Light & Power Company, giving a reliability of service equal to that now being obtained by the original station at Alatrata.

The overhead line will be supported entirely by steel structures fabricated from used rails which the company has on hand. Due to the circuitous route followed by the railway tracks, the entire 70 miles will be fed from two substations. The motive power for the electric zone includes ten locomotives of the six-axle type, with a normal hourly rating of 2,700 hp. These have been in service since 1924.

Coventry Shows Profit on Buses

The annual report of the Tramways and Motor Omnibus Department of the City of Coventry, England, for the year ended March 31, 1927, shows a net profit of £5,226, after interest and sinking fund payments on tramways, and a net profit of £9,851 for the bus system. The railway operating revenues for the year ended March 31, 1927, for the tramways were £97,256, and for the bus system £43,030.

Automatic Substations for Cape Town Suburban Railway

When the electrification now in progress on the Cape Town Suburban Railway is completed it will be the first one in South Africa to have all its substation equipment automatically operated and remote-controlled. The line runs from Cape Town to Simonstown, a distance of about 30 miles. It will have six substations, each of which will contain one or more pairs of 1,000-kw. rotary converters by which three-phase current at 33,000 or 12,000 volts from the Salt River power station will be converted to 1,500 volts direct current for operation.

The load dispatcher located at the central station will be able to start or stop the rotary converters at any of the substations and will be assured by means of visual indications that the machines have done what he wishes and are working properly. For this purpose, all-relay tandem supervisory system of power control of the General Electric Company of England has been adopted.

The twelve pairs of rotary converter sets, with automatic starting equipment, high-speed circuit breakers, etc., are being made at the company's Witton Engineering Works, Birmingham. Supervisory control equipment, really a telephone engineering job, is being supplied by the Peel Connor Telephone Works, Coventry.

Recent Bus Developments

Bus Purchase Approved

Indiana court sanctions plan of Indianapolis Street Railway to take over Peoples Motor Bus

Judge Harry O. Chamberlin in the Circuit Court in Indianapolis on Oct. 25 ordered the Indiana Public Service Commission to approve and authorize the purchase of the stock of the Peoples Motor Coach Company by the Indianapolis Street Railway for \$500,000. The court also ordered the commission to approve the issue of \$500,000 of securities, paying 8 per cent interest, to finance the purchase.

Incidentally the decision is the first of its kind in the state under a law passed by the last Legislature, which gives the right of appeal to the Circuit Court from decisions of the Public Service Commission. It seems unlikely the decision will be subjected to a test which would also serve to try out the validity of the law.

The ruling ends a controversy begun last April 16 by the railway during which the Public Service Commission twice refused to approve the bus company sale. The last refusal was appealed to the Circuit Court. Given an opportunity to change its stand after the hearing before the Circuit Court, provided by law, the commission a third time refused to sanction the purchase.

According to Robert I. Todd, president of the railway, the co-ordination of the transportation system in the city will mean better service. The bus lines, he declared, will be continued and enlarged, with bus service direct from outlying districts now served by railway feeder lines. Except in one or two cases where it is impossible, feeder lines will run to the downtown district instead of ending at the terminal of some car line as at present.

Cost of bus transfers will be reduced from 3 to 2 cents and it will be possible to transfer from a bus to a car line or vice versa.

The Public Service Commission objected to the purchase on the grounds that \$500,000 was an excessive price to pay for the bus company and the 8 per cent interest rate was too high.

Informing the Public on Cars and Buses

The advantages of the street car and bus in one system are told by Thomas N. McCarter, president of the Public Service Corporation of New Jersey, in the Oct. 15 issue of *Forbes*. He makes it plain that the bus has achieved for itself a permanent place in the local transportation field, that its use is increasing rapidly and that it is popular with the traveling public.

In the same issue William A. McGarry tells the story of Joseph H. Alex-

ander and his "give the car rider what he wants." Mr. Alexander is president of the Cleveland Railway, Cleveland, Ohio.

Taxicabs Restrained at Brockton Fair

On the petition of the Eastern Massachusetts Street Railway, Boston, Mass., the Suffolk County Superior Court has granted an injunction to restrain the Blue Ribbon Garage, Inc., of Brockton, from operating five taxicabs for five days during the Brockton fair between the railroad station and the fair grounds. The court finds that the garage cannot compete with a railway without complying first with the state laws as to license and the filing of bonds with the Public Utilities Department.

Buses Run Over Rail Route in Salt Lake City

Permission to discontinue railway service on its Holliday line, below 33d South Street, in Salt Lake City, Utah, and to substitute bus service has been granted the Utah Light & Traction Company by the Public Utilities Commission of Utah. The bus line will be operated over the same route and with the same frequency as the street cars are run at present, and the fares will remain the same. The order of the commission granting the applications of the company provides that a suitable comfortable and convenient passenger depot be provided by the company at or near its terminal at the intersection of 33d South Street and Highland Drive.

Reduced Tickets in Worcester to Induce Riding

Operating officers of the Worcester Consolidated Street Railway, Worcester, Mass., announce that the reason for the adoption of the reduced rate tickets by the company on some of the suburban motor coach lines which it operates is an effort to induce riding in the company's motor cars rather than in the family car. The reduction in rates is expected to encourage more general use of the motor coaches that ply between Worcester and the suburban towns.

The lines affected by the reduced rates include Worcester to Northboro, Marlboro line, Worcester and Shrewsbury and the Worcester, West Bolyston, Oakdale and Clinton route. The purchase of reduced rate tickets enables passengers on these lines to save about 20 per cent in fares. The fare unit for those who do not use the tickets is 10 cents for each zone.

Fares a Factor on New Bus Line in District of Columbia

During a public hearing on an application of the Capital Traction Company, Washington, D. C., for authority to establish a new 25-cent de luxe motor coach line, operating from Cleveland Park to the heart of the business area, it was intimated that the railways of the district are planning to seek an increase in fare. William F. Ham, president of the Washington Railway & Electric Company, who appeared before the commission to oppose the creation of the new line, pointed out that the public desired better service, regardless of cost, but that the rate of fare now was too low to enable the companies to give better service. Mr. Ham's chief objection to the establishment of the new line was that it would compete with the Washington Railway & Electric Company's bus line in Cleveland Park. He said that that line had suffered a loss of \$38,000 since its establishment.

Partial Substitution by Bus in Green Bay

Bus service will be substituted for railway service on the Mather Street car line in Green Bay, Wis., and for the interurban service on the line between the city of Green Bay and the village of Duck Creek about Nov. 1. The City Council of Green Bay recently granted the Wisconsin Public Service Corporation this permission for an eight months trial period. The company is positive that the patrons of these lines will be converted to the bus service during the trial and have purchased three Yellow Cab company buses at an expense of about \$30,000.

Substitution in Troy

The Public Service Commission of New York on Oct. 11 approved the declaration of abandonment by the United Traction Company of that part of its railway line in Troy in Fifteenth Street between Hoosick and Congress Streets and also granted a certificate of convenience and necessity to the Capitol District Transportation Company, Inc., for the operation of a bus line in that part of Troy where the railway service is to be abandoned.

Muncie Operators Win Long Battle

Muncie, Ind., bus operators recently won a long legal battle with the Union Traction Company of Indiana when the Supreme Court of Indiana denied the petition for a rehearing asked by the railway company and made permanent an order restraining the Circuit Court at Anderson, Ind., from imposing fines on the bus operators for contempt.

The railway company, independent bus lines and the city have been in a three-cornered legal fight in numerous

courts for nearly three years, the fight being filled with injunctions of assorted kinds, court decisions, ordinances, public service commission orders and certificates, with the net result that the public passenger vehicles of all those involved have continued to operate in spite of all commands and counter-commands, and the further result that more buses are on the streets than are needed to care for the patrons.

New Rockford Company Would Oust Bus Concern

The Elgin, Belvidere & Rockford Railroad, Rockford, Ill., which has been granted a permit to operate bus lines between South Beloit and Elgin, Ill., is expected to take legal action seeking revocation of the permit held by the Royal Rapid Transit Company, which operates buses over the same route. The case will be followed with interest by traction line heads and bus operators throughout Illinois as a precedent for future relationship between traction and bus interests. The Illinois Supreme Court in a recent Joliet case indicated that traction or steam lines in any territory have first call upon the right to establish bus services in their territory and that coach lines are not favored in the field until the established companies relinquish their claim to bus service.

Anderson Company Appeals Bus Permit

Formal notice that an appeal will be taken from a recent order of the Indiana Public Service Commission granting a certificate of public convenience and necessity for an Indianapolis-Elwood bus line to Ovid N. Hesler of Elwood has been filed with the commission by Arthur W. Brady, receiver for the Union Traction Company at Anderson. The appeal will be made to the Circuit Court at Anderson.

Bus Replaces Stub Line

The Portland Electric Power Company, Portland, Ore., has installed one of its standard buses to take the place of the stub line that ran east from 82d Street and Sandy Boulevard to Park Rose. The railroad was constructed about nineteen years ago by a real estate firm to help develop its land holdings, and the realtors have operated it up to the present time. It was recently decided by the County Commissioners that Sandy Boulevard should be widened east of 82d Street; this necessitated either the paving of the right-of-way or abandoning the whole proposition. The paving and maintenance would be too great, so it decided to turn it over to the Portland Electric Power Company, which will remove the tracks and maintain the bus service. The rate of fare is the same as before, except that employees' tickets will be good on this bus the same as in other parts of the city.

Purchase of West Virginia Lines Announced

Bus lines between Morgantown and Uniontown and Morgantown and Laurel Iron Works, on Lake Lynn, were purchased by the Monongahela Transport Company, subsidiary of the Monongahela West Penn Public Service Company, on Oct. 4. The lines were purchased from Frankhouser and Clark. Morgantown men, who have operated them for some time, and the purchase included considerable equipment, which will be added to the company's garage facilities. Operation of the lines will be under the supervision of Bailey A. Hupp, superintendent of the subsidiary company.

Buses May Replace Cars on Line in Toledo

The Toledo, Ohio, City Council voted to remove the entire tracks on Indiana Avenue between Washington Street and Brown Avenue except the downtown loop—following a four-year fight on the matter, during which time sentiment of property owners and car riders changed considerably. The removal of the tracks will make possible the repaving of the street.

The plan is regarded favorably by the Community Traction Company, as it removes an old parallel line in a territory adequately served by other lines. However, the railway company may put on auxiliary bus service in the district if it is required.

Lawton-Fort Sill Railway Gives Up in Favor of Buses

The Lawton-Fort Sill Street Railway, built in 1914 to connect Fort Sill and Lawton, Okla., ceased operation on Oct. 15. The project will be abandoned until the system is refinanced from fresh capital, it was said. Bus lines running between Lawton and the military post will succeed the cars. During the war the railway carried capacity loads of soldiers. Of late years the cars have been patronized only by a few. The line has not been able to earn a return for its owners for several years.

ORANGE LINES REPORTED SOLD.—The Orange Coach Company, operator of nine buses between Maplewood, N. J., and New York City, is reported to have been sold to the Public Service Transportation Company, Newark, a subsidiary of the Public Service Corporation of New Jersey.

TO EXTEND SERVICE TO BEACH.—The Connecticut Public Utilities Commission has ordered the Connecticut Company to supply bus service to the residents of Sound Beach. To accomplish this the company will have to extend its bus line from Laddin's Rock Corner to Adam's Corner. It was recently granted permission to discontinue railway service in this section.

Financial and Corporate

Jitney Elimination a Factor in Increased Revenues in Savannah

Receipts of the transportation department of the Savannah Electric & Power Company, Savannah, Ga., for the year ended Dec. 31, 1926, were \$813,500. Revenue from both railway and bus operations increased 20.6 per cent. Approximately two-thirds of this was the result of the elimination of jitneys, which ceased operation on Jan. 1, 1926. This was the opinion of Howard C. Fies, president of the company, expressed in his annual report to the stockholders. The balance of the increase could be attributed to the growth of the community.

Operating statistics for 1926 compared with 1925 showed 113 passenger cars in service in 1926, and the same number in 1925; miles of track 62.6 in 1926, and 63.7 in 1925. Buses operated 14 years numbered four against three in 1925. There were 11,861,659 passengers carried in 1926 against 9,845,700 in 1925. No separate statement covering railway operation in detail was obtained in the announcement to the press on which this account is based.

First Kansas City Dividend

The Kansas City Public Service Company, Kansas City, Mo., has declared an initial dividend of \$1.75 a share on class A preferred stock. Voting trustees have fixed Oct. 31 as the record date for certificate holders entitled to the dividend, which will be distributed on Nov. 10.

Save Hocker Line from Junkpile

The Hocker line, known officially as the Kansas City, Lawrence & Topeka Electric Railroad, has been saved from the junkpile. At a meeting of 66 residents of communities along the line, in the Shawnee rural high school in Merriam, Kan., Oct. 20, it was agreed that the residents would raise \$35,000 by Jan. 5, 1928, to purchase the road from the Sonken-Galamba corporation. In addition to the payment of \$35,000, the Sonken-Galamba interests will accept \$1,000 in stock in the line. Service, which was suspended on July 31, will be resumed within 60 days.

Committees have been named to raise funds for purchasing the line. Subscriptions will be taken from residents of Shawnee, Merriam, Rosedale, South Platte and other communities bordering the Hocker line. Articles of incorporation will be filed at the state Capitol at Topeka for the formation of a stock company with the raising of money for the purchase of the controlling interest in the line. It was planned during the meeting to vote a subsidy of township

bonds to repay the subscription raised to purchase the electric line. In case it does not pay for its operation the plan is to place bonds on the market and induce outside capital to finance the road's operation.

The Kansas City Public Service Company will operate the Hocker line for residents at 25 cents per car-mile. The agreement to be made with the Kansas City Public Service Company is termed a sympathetic one in order to allow residents a tram outlet to Kansas City and at the same time to act as a feeder to local city lines of the Kansas City Public Service Company.

Interborough Surplus \$9,362,346

Earnings statement for year ended June 30 shows increase in gross revenue and operating expenses with drop in net corporate income

GROSS operating revenue of the Interborough Rapid Transit Company, New York, N. Y., for the year ended June 30, 1927, was \$63,316,088, compared with \$61,708,814 last year, a gain of \$1,607,273, the result of a gain on the subway division of \$1,152,761, and a gain on the Manhattan railway division of \$454,512. The gain in the revenue from the transportation of passengers was \$2,158,080 and the loss in the other street railway operating revenue \$550,807, principally from advertising, which shows a decrease of \$597,191.

Operating expenses with maintenance and depreciation included on the basis of contractual provisions were \$35,575,666, compared with \$33,540,813 last year, an increase of \$2,034,853, the re-

sult of an increase of \$1,207,890 on the subway division and an increase of \$826,963 on the Manhattan railway division.

The net operating revenue was \$27,740,422, compared with \$28,168,001 last year, a decrease of \$427,579, the result of a loss on the subway division of \$55,129 and a loss on the Manhattan railway division of \$372,450.

The total amount of taxes was \$3,506,823, compared with \$3,350,783 last year, an increase of \$156,040; the subway division shows an increase of \$162,323, while the Manhattan railway division shows a decrease of \$6,283, or 0.26 per cent.

Income from operation was \$24,233,600, compared with \$24,817,219 last year, or a decrease of \$583,619, the result of a loss on the subway division of \$217,452, and a loss on the Manhattan railway division of \$366,167.

Non-operating income was \$257,176, against \$276,980 last year, a decrease of \$19,804, the result of a decrease on the subway division of \$10,278, and a decrease on the Manhattan railway division of \$9,526.

Gross income was \$24,490,775, compared with \$25,094,198 last year, a decrease of \$603,423, the result of a loss on the subway division of \$227,730, and a loss on the Manhattan railway division of \$375,693.

Income deductions were \$21,540,066, compared with \$21,669,158 last year, a decrease of \$129,092.

The net corporate income was \$2,950,709, compared with \$3,425,040 last year, a decrease of \$474,331.

Some \$11,657,966 was spent during the year for maintaining the railroads, power plants and the rolling stock. This amount was \$1,479,821 in excess of the contractual provisions and when de-

COMPARATIVE INCOME ACCOUNT OF INTERBOROUGH RAPID TRANSIT COMPANY

Year Ended June 30	1927	1926
Gross operating revenue.....	\$63,316,087	\$61,708,814
Operating expenses.....	35,575,665	33,540,812
Net operating revenue.....	\$27,740,422	\$28,168,001
Taxes.....	3,506,822	3,350,782
Income from operation.....	\$24,233,599	\$24,817,218
Non-operating income.....	257,175	276,979
Gross income.....	\$24,490,775	\$25,094,198
Income deductions.....	21,540,066	21,669,158
Net corporate income.....	\$2,950,708	\$3,425,040
Add:		
Surplus at beginning of year.....	\$4,968,768	\$1,529,863
Profit and loss account— —net changes during the year*.....	1,442,868	13,865
Totals.....	\$6,411,637	\$1,543,728
Surplus at end of year.†	\$9,362,346	\$4,968,768

* Due principally to adjustment of subway division federal income tax accruals for years 1917 and 1918.

† Stated exclusive of accruals under Contract No. 3 and related certificates payable from future earnings and exclusive of expenditures for maintenance in excess of contractual provisions.

ducted from the net corporate income leaves a balance for the year of \$1,470,888, compared with \$2,443,695 the previous year.

The number of passengers carried was 1,173,646,256, compared with 1,130,484,647 last year, an increase of 43,161,609, the result of a gain on the subway division of 30,346,523 and a gain on the Manhattan railway division of 12,815,086.

The cost of transportation, which includes the cost of power station coal during the year, was \$1,495,720 more than the previous year. Of that amount \$967,876 is incident to the strike of July, 1926, leaving an increase in the ordinary transportation expenses of only \$527,844 for the year, notwithstanding the operation of 3,553,834 additional car-miles and an increase of 5 per cent in wages effective April 1, 1927.

A net expenditure of \$1,425,160 was made during the year for additions, betterments and replacements. This amount includes the company's contribution toward construction and equipment under Contract No. 3 and the related certificates, as well as additions thereto.

The system is made up of 388 miles of single track, of which 249 is subway division, built under Contract Nos. 1 and 2, extension to 148th Street, and Contract No. 3, and 138 comprises the total Manhattan division.

The comparative income account for the years ended June 30, 1927, and 1926, is shown on page 841.

Abandonment of California Branch Line Authorized

Permission has been granted by the Railroad Commission to the Key System Transit Company, Oakland, Cal., to abandon operation of its San Lorenzo branch line between the junction of said branch line with the Oakland-Hayward line and San Lorenzo junction. The applicant showed that the earnings of this line have averaged \$220 a month, while the cost of operation has been approximately \$1,035 a month, a loss that the utility cannot continue to absorb.

Net of New York & Queens County Railway Increased

The New York & Queens County Railway, Long Island City, N. Y., reports earnings as shown in the following table:

Results for Calendar Years:			
Revenue from transportation.....	*1926	*1925	*1924
Other street railway operating revenue.....	\$660,811	\$687,512	\$696,898
	114,904	160,351	19,961
Total.....	\$775,715	\$847,863	\$716,859
Operating expenses.....	626,804	687,939	580,181
Taxes.....	33,156	35,921	39,401
Income from operations.....	\$115,755	\$124,004	\$97,277
Non-operating income.....	6,809	5,055	2,665
Gross income.....	\$122,563	\$129,059	\$99,942
Interest deductions—unpaid taxes.....	2,452	8,749	16,297
Other rent deductions.....	3,097	9,841	11,542
Net corporate income.....	\$117,013	\$110,469	\$72,103

* Receiver's operations only.

Balance of \$1,011,383 in Denver

The statement of earnings and expenses of the Denver Tramway Corporation and the Denver & Intermountain Railroad (with intercompany transactions eliminated) and direct debits and credits to surplus for the twelve months period ended Dec. 31, 1926, is as follows:

Total operating revenue.....	\$4,565,251
Less operating expenses and taxes:	
Operating expenses (not including depreciation).....	2,452,131
Taxes.....	543,029
Total operating expenses and taxes.....	\$2,995,160
Net operating income.....	\$1,570,090
Total miscellaneous income.....	54,497
Gross income less operating expenses and taxes.....	*\$1,624,588
Deductions from income:	
Interest of underlying bonds.....	249,959
Balance.....	†\$1,374,629
Interest on general and refunding bonds.....	322,175
Balance.....	\$1,052,454
Less net profit and loss charges (including \$40,750 appropriated to Insurance Fund to enable corporation to carry part of its fire insurance).....	41,071
Balance available for depreciation and for dividend requirements on 104,164 shares of preferred stock.....	\$1,011,383
* Equals 6.50 times interest on underlying bonds.	
† Equals 4.27 times interest on general and refunding bonds.	

Engineers Public Service Increases Directorate

Frank L. Babbott and Edwin S. Webster, the latter president of Stone & Webster, Inc., have been elected additional directors of Engineers Public Service Co., Inc., increasing the directorate to nineteen members. Mr. Webster was one of the original directors, but resigned just before taking an extended trip abroad.

The Engineers Public Service Company controls various utility corporations, including electric railways, under executive management of Stone & Webster.

Deficit in Portland, Me., Continues

For the year ended Dec. 31, 1926, the gross income of the Portland Railroad, Portland, Me., leased by the Cumberland County Power & Light Company, was \$1,402,767, compared with \$1,451,902 for 1925. Operating expenses and taxes were \$1,183,031, against \$1,178,574 for the year previous. A deficit of \$27,862 is compared with a net income of \$25,730 in 1925. After the consideration of dividends, operation in 1926 resulted in a deficit of \$127,812, against a deficit of \$74,220 in 1925.

sulted in a deficit of \$127,812, against a deficit of \$74,220 in 1925.

The annual statement to the stockholders says that in spite of the increased deficit from the operation of the railroad property the company's earnings for the year showed an increase for dividends after deduction of \$370,200 for depreciation reserve, of which \$120,000 was applicable to the railroad property.

Would Abandon California Line

The Central California Traction Company has applied to the California Railroad Commission for permission to abandon its Sunnyside line from the intersection of Cherokee Lane to the intersection of Park and Ophir Street in the city of Stockton. It is the claim of the company that the revenue from that line is inadequate to pay the expense of operation.

Interstate Would Sell Common Stock

In a petition filed with the Indiana Public Service Commission the Interstate Public Service Company, Indianapolis, Ind., asked authority to issue and sell 3,333 shares of no par value common stock to raise approximately \$250,000 for refunding purposes. The securities issue is sought in connection with the purchase of the New Albany Street Railway on Oct. 30, 1925, and is also intended to reimburse the Interstate treasury for money applied to refunding bonds that fell due Aug. 1, 1927.

Oregon Line Buys Steam Property

The Portland Electric Power Company bid in the Willamette Valley Southern Railroad for \$272,000 at public sale on Oct. 17. There was a judgment for \$1,000,000 held against the railroad for power, materials and work furnished in the last twelve years. The Portland Electric Power Company will continue to operate the railroad as usual for passenger service between Oregon City and Molalla and for operations of the Eastern & Western Lumber Company.

London Shareholders Ratify Conversion Plan

Speyer & Company have been advised that the shareholders of the Underground Railways, London, England, have ratified the readjustment plan whereby holders of 6 per cent income bonds are to receive the option to convert their bonds into fully paid £1 ordinary shares of the company.

The plan provides that the bonds may be converted at any time before July 1930, at the rate of £1 fully paid ordinary share for every £1 ls. face amount of bonds. Income bonds may be deposited in New York for the exercise of the conversion privilege.

COMPARATIVE STATEMENT OF THE OPERATING RESULTS OF THE LONDON UNDERGROUND GROUP,
YEAR 1926, COMPARED WITH 1925

	Railways		London General Omnibus Company, Ltd.		Total	
	1926 £	Increase £	1926 £	Increase £	1926 £	Increase £
Receipts, after the operation of the common fund under the terms of the London Electric Railway Companies' facilities act agreement, dated Dec. 21, 1915, and supplemental agreement, dated Dec. 8, 1921.....	4,825,914	226,297	8,371,713	272,322	13,197,627	46,026
Expenditure.....	3,007,896	168,114	7,998,915	249,558	11,006,811	81,444
Net receipts.....	1,818,018	58,183	372,798	22,764	2,190,816	35,419
Miscellaneous receipts (net).....	537,699	33,447	389,411	59,519	927,110	92,966
Net income.....	2,355,717	91,630	762,209	36,755	3,117,926	128,385
Interest, rentals and other fixed charges.....	1,222,620	116,399	234,335	20,011	1,456,955	136,410
Balance.....	1,133,097	24,769	527,874	16,744	1,660,971	8,025
Appropriation to reserve for contingencies and renewals.....	155,000		325,000	25,000	480,000	25,000
Balance.....	978,097	24,769	202,874	8,256	1,180,971	33,025
Dividends on guaranteed and preference stocks.....	389,477				389,477	
Balance.....	588,620	24,769	202,874	8,256	791,494	33,025
Add balance from last year's accounts.....	257,673	9,286	67,501	6,999	325,174	16,285
Total amount available for dividends on ordinary stocks and shares and for other purposes.....	846,293	15,483	270,375	1,257	1,116,668	16,740
Dividends on ordinary stocks and shares.....	604,103		206,250	2,119	810,353	2,119
Rate per cent per annum.....	3.54		(Free of tax)		4.09	
Balance carried forward to next year's accounts.....	242,190	15,483	64,125	3,978	306,315	18,859

London Underground Railways
and General Omnibus Company
Report Year's Operations

London underground railways lost 9,000,000 passengers last year despite the fact that 7 additional route-miles were opened for traffic in September. Report of the last annual joint convention of the London Underground Railways and the General Omnibus Company as reviewed by Lord Ashfield, Feb. 24, showed that there was an increase in bus traffic of 13,000,000 passengers; this increased carriage was provided for by 59 additional miles of road. During the year 112 additional cars were purchased for the tube railways. Operation costs per mile on railways has been reduced 1½ per cent, while cost of bus operation amounted to 34 per cent reduction. The combined companies have obli-

gated themselves to spend £25,000,000 on improvements and extensions since the year 1918.

Expenditures influencing the cost of operation were, according to the report, costs of coal, amounting to £144,000; £57,000 was incurred during the general strike; loss of £339,000 was due to labor troubles, and the burden of taxation, which included £400,000, compared to £330,000 the preceding year. Contribution of seven-tenths of a penny now is paid for every mile run by buses, including also the company's share of road maintenance. Burdens laid by Parliament on this group of companies last year amounted to £711,000, equal to 5 per cent of the gross receipts and to 88 per cent of the amount distributed in dividends on ordinary stocks. Of this sum, £589,000 was required to meet taxation in the strict sense. The balance was represented by contributions toward

health, pensions and unemployment. About one-fifth of the amount distributed in dividends had to be paid in income tax, so that the ordinary shareholders received not more than £648,000, while the government received £751,000.

Bus service was restricted last year because of the order of the Ministry of Transport to withdraw 45 buses from its main routes. These buses, however, have been put in operation on routes new and not much used. Of all the routes worked in 1926, 87, or 29 per cent, did not earn sufficient to pay expenses including depreciation and renewals. The company also has acquired controlling interests in several of the smaller lines and is gradually consolidating them.

Operating data on the London Underground group are shown in the accompanying statements.

MISCELLANEOUS STATISTICS OF LONDON UNDERGROUND GROUP, YEAR 1926, COMPARED WITH 1925

	Total Railways		London General Omnibus Company, Ltd.		Total	
	1926	Increase	1926	Increase	1926	Increase
Passengers carried:—						
Ordinary.....	210,470,208	7,444,288	1,249,353,228	12,805,475	1,459,823,436	5,361,187
Workmen.....	50,580,564	836,422			50,580,564	836,422
Persons.....	48,727,502	642,856			48,727,502	642,856
Total.....	309,778,274	8,923,566	1,249,353,228	12,805,475	1,559,131,502	3,881,909
Average daily number of passengers carried.....	921,573	24,332	3,712,788	54,363	4,634,361	33,031
Rate-miles owned or leased.....	M. 78 62	Ch. 6 59	M. 78 62	Ch. 6 59	M. 78 62	Ch. 6 59
Rate-miles run over by companies' trains.....	128 22.5	6 59	860 0	59 0	128 22.5	6 59
Rate-miles run over by company's omnibuses.....					860 0	59 0
Number of stations.....	125	7	44	1	125	7
Number of garages.....					44	1
Number of lifts.....	171	14			171	14
Number of escalators.....	63	23			63	23
Number of car-miles run in relation to passenger receipts.....	65,398,129	38,584	138,784,175	5,159,086	204,182,304	5,197,610
Number of car-miles run by companies' trains or omnibuses.....	72,307,654	563,983	138,784,175	5,159,086	211,091,829	5,723,009
Number of cars or omnibuses owned.....	1,770	182	3,935	201	5,705	19

Includes 12 miles 49 chains run over the City & South London Railway (Euston to Morden).
Includes 15 miles 48 chains run over the London Electric Railway (Kensington and Euston to Edgware and Highgate).

* The number of omnibuses owned and/or worked by or in conjunction with the London General Omnibus Company, Ltd., is 4,703, compared with 4,704 in 1925. Italics denote decrease.

Personal Items

A. C. Baker and T. Rowland Visit America

Two keen students of electric railway and bus transportation have completed a thorough study in this country of modern methods and equipment. They are A. C. Baker, chief engineer of the Birmingham Corporation Tramways, Birmingham, England, and his assistant, T. Rowland. These distinguished representatives of a large English tramway system arrived in New York on Oct. 1 and went immediately to Cleveland to attend the American Electric Railway Association convention. There they expressed themselves as much interested in the cars and buses that were on exhibition. While in Cleveland they also made an extensive inspection of the Cleveland Railway.

From Cleveland they went to Detroit, where under the direction of Charles F. Hewitt, staff engineer of the Detroit Municipal Railway, they inspected the cars and the buses in operation and studied the system of traffic control. Their next objective was Chicago, where they visited the shops of the Chicago Surface Lines and the Chicago Rapid Transit Company, as well as the Chicago Motor Coach Company's plant. Next on their route east they visited Buffalo and Boston and returned to New York on Oct. 18. In New York they studied railway and bus operation and as guests of L. H. Palmer, general manager of the Fifth Avenue Coach Company, they visited the new Holland Vehicular Tunnel from New York to New Jersey. Later they visited Philadelphia.

Martin Ackerman with Peoples Railway

Martin Ackerman has been appointed manager of the Peoples Railway, Dayton, Ohio, under control of the American Electric Power Company of New York, effective Oct. 17. Stevens & Wood are operating managers of this property.

Early in 1926 Mr. Ackerman, who was serving as general manager of the Cincinnati & Dayton Traction Company, resigned to become general manager of the Lake Shore Electric Railway, with headquarters at Sandusky. At that time the *ELECTRIC RAILWAY JOURNAL* commented upon the fact that Mr. Ackerman was returning to take charge of the property on which he had obtained his early electric railway experience. There he had served as a shop man and then as a trainman. In time he advanced to the positions of train dispatcher and trainmaster.

Early in his career Mr. Ackerman became connected with the Youngstown & Ohio River Railway, originally a steam line running between Washington and Salem, Ohio. Some four months

later he assumed the general management of the Springfield & Xenia Railway. He continued with this property, making it a paying proposition, which it had not been prior to his supervision, until 1914, when he took over the operation of the Interurban & Terminal Company of Cincinnati as general superintendent. He seemed to have the knack of converting losing ventures into paying ones, for here too a surplus in earnings was reported. Although this healthy condition did not last, due to war-time handicaps, his reputation had been made and he received the appointment of general manager of the Cincinnati & Dayton Traction Company in July, 1918.



Martin Ackerman

In the face of hard times and subsequent operation under a receivership Mr. Ackerman carried on and did a great deal to restore a property which was fast making for the rocks. The company has since been reorganized with a cut in debt from \$4,900,000 to \$1,300,000. He helped to pave the way for this happy result.

L. V. Sutton Promoted to Post in Mississippi

L. V. Sutton, former assistant manager of the Arkansas Power & Light Company, Little Rock, Ark., has been promoted to the position of vice-president and general manager of the Mississippi Power & Light Company. He has started on his new duties at Jackson, Miss. Mr. Sutton went to Little Rock in August, 1924, from Raleigh, N. C., where for twelve years he had served the Carolina Power & Light Company. Before that time he was connected with the General Electric Company at Lynn, Mass.

Mr. Sutton was born in Richmond, Va. He was graduated from the Virginia Polytechnic Institute, where he had majored in electrical engineering.

The Mississippi Power & Light Company operates 12 miles of line in Jackson, Miss., and 11 miles in Vicksburg.

This company and the Arkansas Power & Light Company are controlled by the Electric Power & Light Corporation, New York, N. Y.

A. R. Koonce and Rex I. Brown Promoted in Arkansas

Some of the duties of L. V. Sutton who recently left Little Rock, Ark., to assume new duties as vice-president and general manager of the Mississippi Power & Light Company, Jackson, Miss., will be undertaken by A. R. Koonce, superintendent of the Little Rock railway department of the Arkansas Power & Light Company. Mr. Koonce has been made general superintendent in direct charge of the railway department and will act in an advisory capacity for the Pine Bluff Railway system.

Twenty-six years ago Mr. Koonce entered the employ of the local railway company as a blacksmith's helper. He advanced through the various positions of night foreman, day foreman and master mechanic until in 1918 he was made superintendent of the railway department.

Vice-President Griffith, who gave Mr. Koonce his first position with this property, said that both he and R. I. Brown, who will cover the other duties of Mr. Sutton in the electric end of the business, were deserving of the promotion. Mr. Brown, who has been made assistant to Vice-President C. J. Griffith directly in charge of the electric department, will continue his duties as commercial manager, as will Mr. Koonce continue in his present position in addition to taking on new duties.

A. W. McLimont Honored on Decade of Progress

To honor his ten-year service record with the Winnipeg Electric Company as general manager, a complimentary dinner was tendered to A. W. McLimont, president, by the supervisory employees of the company on Oct. 1. The dinner was held in the Royal Alexandra Hotel, Winnipeg, and was attended by the local directors. Speeches sketched the history of the Winnipeg Electric Company over the past ten years, indicating its progress in the capable hands of Mr. McLimont. Later Mr. McLimont was presented a silver loving cup as an expression of esteem by the members of his organization.

In addressing the happy gathering Mr. McLimont said that there were three outstanding factors which had to be considered in connection with every problem which presented itself. The first one was public relations; second capital, and, third, loyal labor. He said he believed the company today was on the threshold of a great development that the growth of the company mirrored very clearly the future of the community. It was his desire that every employee should assist "in getting and maintaining the confidence of the public

wise—as well as capital and labor—in and in our good intentions.”

The occasion for honoring Mr. McLimont recalled to mind the comment on his progressive policy in big business which appeared in an article appreciative of Mr. McLimont in the *Canadian Financial Post* for June 24. His avert in a threatened strike of the trainmen was said to be only one of the big steps he had taken in putting the company on a sound basis.

When Mr. McLimont was induced to go to Winnipeg the Winnipeg Electric Company was in a dangerous state of

disorganization, confronted with labor troubles, producing no dividends, hampered by the provisions of an old franchise and its equipment in need of repairs and replacements. The hardest job was getting the old franchise adjusted on an equitable basis since the old franchise made no provision for the necessary increase in revenue. The adjustment was accomplished and then he set about the task of rearranging the company's labor program. His endeavors to make the organization satisfactory to the company, the men and the city, have met with no little success.

Harry L. Brown

Secretary of Ohio Brass Company and former editor of "Electric Railway Journal" died at Toledo on Oct. 23—Long a constructive force in industry and active association worker

HARRY L. BROWN, secretary of the Ohio Brass Company and formerly editor of the *ELECTRIC RAILWAY JOURNAL*, died at Toledo, Ohio, on Oct. 23. He was stricken with appendicitis while returning home to Mansfield after attending the Ohio-Michigan football game at Ann Arbor, and did not recover from the shock of the operation which it was deemed necessary to perform at once.

Harry Brown, as he was familiarly known, was a constructive force in the electric railway industry. This was true of his work as a member of the staff of the *ELECTRIC RAILWAY JOURNAL*, later as editor of this paper, and still later as an officer of the Ohio Brass Company. It is putting no strain on facts to say that he was a brilliant man. A brilliant man is ever aggressive—his mentality compels him to action. While he grapples friends to him with hooks of steel, he is very likely to be misunderstood by those who do not know him well and are given to judging superficially. It fell to Harry Brown's lot to be so judged on occasion because of his militancy as a journalist, but he and the paper he served had the satisfaction of seeing improvements made and of witnessing the carrying out of plans which the paper advocated.

The man had about him the air of the natural doer of deeds. He had small pliance with mediocrity, and he despised complacency, neither of which has any place in the general scheme of things, at least of all in journalism. If it be a fault to be intolerant of these human but pernicious failings, then Harry Brown had that fault, but there was nothing hypercritical about it. If he did not spare others in the tasks which he allotted to them, he certainly did not spare himself. And never was that more evident than in his work as chairman of the subjects and meetings committee at the recent convention at Cleveland. Recognition of the ability of the man to get things done came to him again at the Oct. 6 meeting of the American executive committee, which reappointed him chairman of the committee on sub-



Harry L. Brown

jects and meetings for the year 1927-1928. Of the important work that he did for the Ohio Brass Company perhaps the most conspicuous was his contribution to its publicity and advertising activities.

Great as was his service to the industry through his general activities in association affairs and in serving as a member of the American executive committee, none of the work of this kind that he did really overshadowed in its importance his contribution in 1924 along with Secretary Welsh and Harley Johnson, as a member of the committee on foreign practice. These men spread before the industry a summary of foreign practices with comment on the applicability of things being done in Europe for adoption in the United States. It was a difficult task done with celerity.

Conspicuous work by the man as Western editor of the *ELECTRIC RAILWAY JOURNAL* led eventually to the elevation of Harry Brown to its editorship on Jan. 1, 1923. As a field editor he

had hitched his wagon to a star. He saw clearly—and, more important, journalistically—the place that the bus was to play in the transportation industry, appraised accurately the need for better public relations and for merchandising the service, and recognized that it was essential to modernize both railway plant and operation methods. In all he served the McGraw-Hill Publishing Company, Inc., ten years, starting as an editorial apprentice in the capacity of assistant editor *Electrical World* in 1915.

For two years after he was graduated from the University of Michigan and before taking up editorial duties he was engaged in engineering work with the Aurora, Elgin & Chicago Railroad and the Chicago Telephone Company. During the war he was first lieutenant and captain in the Signal Corps. He was born in Grand Rapids 38 years ago.

Many men prominent in the industry telegraphed expressions of sympathy to Mansfield.

E. F. Wickwire, vice-president Ohio Brass Company, voiced the sentiment of the other officers, directors and associates of Mr. Brown in the following words:

Expressions that have poured in from Harry Brown's host of friends testify eloquently to the magnitude of the loss which his passing occasioned. The sense of loss is doubly strong in us who have been so close to him.

Of him Lucius S. Storrs, managing director of the American Electric Railway Association, said:

It is difficult for me to realize that Harry L. Brown has passed on. Only yesterday he was applying his seemingly indefatigable energy to making the American Electric Railway Association convention a success. And only the day previously, it seems, he was using his great editorial ability in fighting for the progressive things in local transportation. He will be missed wherever local transportation exists, because everywhere in it there are forward steps directly traceable to his efforts. But most of all he will be missed as a charming and congenial friend.

J. W. Welsh, secretary of the American Electric Railway Association, said:

I came to know Harry Brown rather intimately as a member of the association's committee on foreign operation that studied transportation problems in Europe in 1924. He was a keen observer. He had a clear appreciation of relative values and a happy way of expressing himself in his writings. For years he has been an active worker in the association and has been a member and chairman of its most important committees. He was a leader among those who were thinking along modern and progressive lines. His loss will be very keenly felt.

James H. McGraw, president of the McGraw-Hill Publishing Company, Inc., publisher of the *ELECTRIC RAILWAY JOURNAL*, said:

Harry L. Brown, in addition to his personal charm and rare ability, had many of the qualities of leadership. He did not shy at a new idea. Still more important, he never counted the cost to himself of the work involved in carrying out any project upon which he launched. His work in journalism, exacting as it was, proved this, as well as did his work in other lines, par-

ticularly his activities in behalf of the American Electric Railway Association. In voicing my own sense of loss at his passing, I know that I express the sentiments of all the officers of the McGraw-Hill Publishing Company, Inc., and more particularly the sentiments of the members of the staff of the *ELECTRIC RAILWAY JOURNAL*, which he served loyally and faithfully. His was a constructive influence the industry can ill afford to lose.

Funeral services were conducted at his late home in Mansfield on Wednesday morning. The pallbearers were Messrs. Sawyer, Bozell, Wickwire, Mason, Jameson and Huntington. Later the remains were taken to the home of Mr. Brown's parents in Grand Rapids, Mich., where brief services were held Thursday morning. The interment was in the family plot at Fuller Cemetery, near Hastings, Mich. He is survived by his father, mother, wife and two children.

JOHN R. H. STALEY, right-of-way expert for the Public Service Company of Northern Illinois, died on Sept. 13 in Joliet, Ill., two years after his retirement from active duty. He went to Joliet 42 years ago and began as lineman for the old Economy Light & Power Company. Later he was advanced to superintendent, which position he held when the company was absorbed by the Public Service Company.

C. F. McELROY, instrumental in the organization of the Carthage Electric Railway Company, Carthage, Mo., which built and operated the Carthage to Cartersville line, died recently. He was secretary of the company and continued in that capacity until the consolidation of the line as a part of the Southwest Missouri Railroad. Mr. McElroy was 79 years old.

GEORGE ST. PIERRE, retired superintendent of equipment of the Key System Transit Company, Oakland, Cal., died recently as a result of injuries sustained in an auto accident in Walnut Creek, Cal., on Oct. 13. When he retired from the Oakland System in the spring of 1925 he had been connected with the local railway for 39 years. Mr. St. Pierre went to California from Montreal, where he served his apprenticeship as marine machinist.

PERLEY F. WALKER, dean of the School of Engineering of the University of Kansas, Lawrence, Kan., since 1913, committed suicide Oct. 17 in his office at the university. He was a national figure in engineering circles. Dean Walker was the author of "Management Engineering," published by the McGraw-Hill Book Company, and had contributed articles on various topics to the technical press. He served as president of the Society for the Promotion of Engineering Education in 1923-1924, was a past-president of the Kansas Engineering Society and a member representative of the American Society of Mechanical Engineers on the American Engineering Council. Dean Walker was born in Embden, Me., in 1875.

Manufactures and the Markets

Improvements of Over a Million by Altoona & Logan Valley

The Altoona & Logan Valley Electric Railway, Altoona, Pa., it is reported has completed a three-year program of track building, new car purchase and general improvement at a total cost of \$1,047,946, as follows:

The installation of new track, paving and drains under the tracks cost \$533,435; safety and efficiency equipment for street cars, \$45,376; thirteen steel-body, light-weight, double-truck safety cars purchased new, \$212,065; rebuilding three single-truck safety cars, \$13,464; substation equipment and distribution lines for power, \$74,867; a bridge construction job, \$42,794; conveyance, electric welders, telephone lines and signals, \$32,095; five auto buses, 21-passenger style, \$31,435; two other buses for use at Tyrone, \$12,469; two additional buses in use in Altoona, \$11,000, and the building of a new garage to house 25 buses, \$38,942.

Carolina Company Awards \$96,300 Contract for Carhouse

Contract for construction of the Carolina Power & Light Company's new carhouse in Asheville, N. C., has been awarded to the Palmer-Spivey Construction Company, Charlotte and Asheville, on a bid of \$96,300. The building is to be a two-story fireproof structure and will contain space for storage of the company's street cars and buses. Installation of track and other equipment for the structure will make the cost of the plant approximately \$175,000.

Basic Bessemer Process Dropped from British Rail Specifications

The British Engineering Standards Association has decided to remove all reference to basic bessemer process from specifications for bull-head and flat-bottom rails, the use of this process being no longer in accord with British practice.

Big Track Job Under Way by Los Angeles Railway

The engineering department of the Los Angeles Street Railway, Los Angeles, Cal., has started work on the renewal of a crossing at Macy and Alameda. It is also engaged in a complete reconstruction of track with 116-lb. girder rail on Pasadena Avenue between Avenue 18 and San Fernando Road. Work is now in progress, it is reported, on the largest track job which the company has ever undertaken, the complete reconstruction of track on San Pedro Street from Ninth to 36th Street. New

116-lb. steel girder rail will replace the old 60-lb. rail, with a view to providing more comfort for passengers and smoother riding. The roadbed is rock-ballasted with drain tile on both sides and 8-in. concrete paving with asphalt surface is used. The job will cost \$200,000.

General Electric Exhibiting Great Northern Electric Unit

The largest motor-generator type electric locomotive in the world, one of four being built by the General Electric Company for the Great Northern Railway for hauling passenger and freight trains through the new 7½-mile tunnel piercing the Cascade Mountains, is being exhibited during this month at cities along the Great Northern road. Some of the main specifications of these units follow:

Total weight.....	518,000 lb.
Weight on drivers.....	409,800 lb.
Length over couplers.....	73 ft. 9 in.
Length of wheel base.....	58 ft. 8 in.
Number of driving axles.....	6
Number of guiding axles.....	2
Diameter of driving wheels.....	55 in.
Diameter of guiding wheels.....	36 in.
Number of motors.....	6
Speed continuous rating.....	18.7 m.p.h.
Maximum speed.....	50 m.p.h.

Large New England Contract for English Electric Company

The English Electric Company has obtained a contract for complete electrification of the railway from Christchurch to Lyttleton, New Zealand, at a cost of about £100,000. The order includes 45 miles of overhead line material, six 1,500-volt locomotives of the four-axle type, 3 ft. 6 in. gage, each machine weighing 50 tons, and a substation plant. There is only one substation, and it is arranged for remote control. It will be supplied with three phase current at 10,500 volts, 50 cycles.

G. E. Directorate Inspects Fort Wayne Plant

The entire board of directors of the General Electric Company was in Fort Wayne, Ind., Oct. 14 for a business meeting and an inspection of the Fort Wayne works of the company. Those attending were: Gerard Swope, president, of New York City and Schenectady; Jesse R. Lovejoy, New York, vice-president; George F. Morrison, vice-president, and Owen D. Young, chairman, both of New York; E. Wilbur Rice, Jr., honorary chairman, of New York and Schenectady; Oliver Ames, Gordon Abbott, Robert Treat Paine II, George P. Gardner, Philip Stockton, Francis L. Higginson, all of Boston; Marsden J. Perry, Providence, R. I.; Bernard E. Sunny of Chicago; Burton G. Tremaine of Cleveland; Mel-

T. Traylor of Chicago; Henry M. Robinson of Los Angeles; George F. Baker, Jr., Seward Prosser, Dwight W. Morrow and Clarence N. Woolley, all of New York City. Several of these men have visited the Fort Wayne works on various occasions before, but this is the first time the entire board has assembled in the city.

Worcester's Railway Rehabilitation Program Shows Large Expenditure

The rehabilitation program of the Worcester Consolidated Street Railway, Worcester, Mass., has cost approximately \$1,510,848 in the first nine months of this year, according to officials of the company, it is reported. The New York, New Haven & Hartford Railroad, when it resumed control of the franchise, it is understood, promised to expend \$1,000,000 in rehabilitating the road. One of the major items of expense was the purchase of 50 new cars from the Osgood-Bradley Company of Worcester at a cost of \$708,550. A de-

scription of these units and the ceremony attendant upon the official demonstration trip of the first of them appeared in an article in the JOURNAL Oct. 1. All but three of these cars have been delivered.

The new carhouse at Grove Street, Worcester, will represent the expenditure of \$250,000 when completed and \$75,000 has already been spent in building a new garage for buses. Sixteen new buses have been purchased at a cost of \$149,500. Car route numbers have cost \$15,000. Other expenditures included a new automobile truck at a cost of \$4,800 and special line work \$18,164. On Oct. 1 \$209,834 had been spent for track construction, with the end of the program in this direction not yet in sight.

National Power Show Scheduled for Dec. 5-10

The sixth National Exposition of Power and Mechanical Engineering will be held at the Grand Central Palace, New York, from Dec. 5 to 10 inclusive, and at the same time as the exposition

is held the annual meetings of the American Society of Mechanical Engineers and American Society of Refrigerating Engineers will be held. Numerous other organizations will meet at the same time as the exposition; some of these will meet jointly with, or in bodies attend, the exposition.

Quiet Week in Metal Markets

The extreme activity in buying of copper and lead apparently ran its course last week and the week ended Oct. 26 has been a quiet one in the non-ferrous metal markets. Buying of copper has been particularly dull, whereas there was a little more activity in zinc than in the preceding week. Prices have tended toward lower levels, zinc suffering particularly in this respect.

The copper market has again relapsed into a condition of stagnation such as existed prior to the wave of buying that took place last week. As before, the leading producers are almost uniformly holding at 13.25 cents, at which level only scattering sales have been made and these in small tonnages. Export

Ten Units for Northern Texas Traction Company



Exterior of one of the ten units for the Northern Texas Traction Company

Specifications have recently been released by the Northern Texas Traction Company, Fort Worth, Tex., on ten one-man, double-end, city type, double-truck cars built by the St. Louis Car Company. The cars are of all-steel construction, 39 ft. 11½ in. over all, with a total weight of 35,000 lb. each, and designed to seat 50 passengers. One of the cars was exhibited at the Cleveland convention. General Electric No. 26 motors are part of their equipment. So joined are the specifications as sent to the JOURNAL by L. E. Thorne.



Interior view of one of the units built for the Northern Texas Traction Company

Number of units.....10
Type of unit.....One-man, motor, passenger, city, double end, double truck
Builder of car body.....St. Louis Car Co., St. Louis, Mo.
Date of order.....April 25, 1927
Date of delivery.....Aug. 31, 1927
Weight, total.....35,000 lb.
Length over all.....39 ft. 11½ in.
Length over body posts.....26 ft. 5½ in.
Width over all.....8 ft. 8½ in.
Height, rail to trolley base.....11 ft. 0 in.
By.....All steel
Rear.....Arch

Air brakes.....Safety Car Devices Company
Armature bearings.....Plain
Axles.....A.E.R.A. standard, 4-in. diameter
Car signal system.....Faraday
Compressors.....Westinghouse DH-16

Conduit.....Cables in canvas hose
Control.....K-75A controller, No. 98A cutout switch
Curtain fixtures.....National Lock Washer Co.
Curtain material.....Pantaforte, double faced
Destination signs.....Hunter Illuminated
Door mechanism.....National Pneumatic Co.
Doors.....End, folding
Energy-saving device.....Economy meters
Fare boxes.....Johnson Pneumatic
Finish.....Enamel Ripolin
Floor covering.....Linoleum, green cork
Gears and pinions.....G. E.
Glasses.....Non-shatterable
Hand brakes.....St. Louis Car Co. No. 10558
Hand straps.....Sanitary hand holds
Heaters.....Consolidated type R
Headlights.....E.S.S. Co. S.M. 95
Headlining.....Haskelite ½ in.
Interior trim.....Mahogany finish
Journal boxes.....Symington
Lamp fixtures.....E.S.S. Co., dome type
Motors.....Four G.E. 265, inside hung
Registers.....International, type R
Roof material.....Treated canvas
Sash fixtures.....O. M. Edwards, bronze nickel plated
Seats.....Heywood-Wakefield, No. 327-M.S.
Seating material.....Cleveland Tanning Co., Hyline train
Slack adjusters.....Westinghouse
Steps.....Folding
Step treads.....Fersalup, type A
Trolley catchers.....Keystone No. 23154
Trolley base.....Q. B. form 4
Trolley wheels.....Miller trolley shoes
Trucks.....St. Louis Car Co., form E-1B-64
Wheels.....26-in. rolled steel
Wheelguards.....H. B. life guards

METAL, COAL AND MATERIAL PRICES F. O. B. REFINERY

Metals—New York		Oct. 25, 1927
Copper, electrolytic, cents per lb.	12.937	
Copper wire, cents per lb.	15.25	
Lead, cents per lb.	6.25	
Zinc, cents per lb.	5.90	
Tin, Straits, cents per lb.	58.50	
Bituminous Coal, f.o.b. Mines		
Smokeless mine run, f.o.b. vessel, Hampton Roads, gross tons	\$4.175	
Somerset mine run, Boston, net tons	1.80	
Pittsburgh mine run, Pittsburgh, net tons	1.825	
Franklin, Ill., screenings, Chicago, net tons	1.575	
Central, Ill., screenings, Chicago, net tons	1.25	
Kansas screenings, Kansas City, net tons	2.30	
Materials		
Rubber-covered wire, N. Y., No. 14, per 1,000 ft.	\$5.50	
Weatherproof wire base, N. Y., cents per lb.	16.00	
Cement, Chicago net prices, without bags	2.05	
Linseed oil (5-bbl. lots), N. Y., cents per lb.	10.2	
White lead in oil (100-lb. keg), N. Y., cents per lb.	13.75	
Turpentine (bbl. lots), N. Y., cents per gal.	\$0.52	

sales have been made in reasonable volume at the association price of 13.60 cents, c.i.f., and at 13.35 cents, f.a.s.

A moderate business in zinc was done during the week, but at gradually declining prices. The market is established for the time being at 5.90 cents. Producers of high grade zinc quote 7.75 cents, New York, as against 8 cents, which they have held for several months. However, the price is purely nominal as the market is dead.

The continued weakening in the London lead market, which culminated Oct. 25 in a spot quotation of only £20 2s. 6d., put a quietus on buying in the United States, consumers evidently thinking a reduction in prices was in order. Middle Western producers did go back to 6 cents, St. Louis, but the American Smelting & Refining Company continued its contract price in New York at 6½ cents. On Oct. 26 some encouragement was felt in the advance reported from London, and from the good foreign demand that the lower prices of the week have developed.

A fair demand for tin for prompt shipment to consumers manifested itself during the week, but in general the market has been rather quiet at prices varying between 58 and 59 cents per pound for prompt Straits. Futures have been approximately half a cent lower.

ROLLING STOCK

NEW YORK STATE RAILWAYS, Rochester, N. Y., has ordered three White buses, Model 50-B, with 25-passenger bodies.

SHAMOKIN & TREVORTON BUS LINE COMPANY, a subsidiary of the Shamokin & Edgewood Electric Railway, Shamokin, Pa., has accepted delivery on a 25-passenger Mack city type bus, 196-in. wheelbase, with four-cylinder motors. This bus, it is reported, will replace railway equipment between Shamokin and Paxinos, a 4-mile route.

SAN DIEGO ELECTRIC RAILWAY, San Diego, Cal., announces the purchase of additional equipment to take care of the ever-increasing traffic on the existing bus routes and also for new exten-

sions recently added, including the bus service between San Diego-La Mesa and El Cajon, which added approximately 16 miles of bus route to the system. One A.C.F. six-cylinder, 31-passenger bus was purchased a few weeks ago and orders have recently been placed for an additional Fageol 31-passenger bus and also one of the new Twin-Coaches developed by Frank R. Fageol. These late acquisitions bring the total bus fleet operated on regular schedules to 21.

TWIN CITY MOTOR BUS COMPANY, subsidiary of the Twin City Rapid Transit Company, Minneapolis, Minn., is standardizing its buses with one-body models on Mack and White chassis. Between fifteen and twenty old buses will be replaced within a year, it is reported.

TRACK AND LINE

TRI-CITY RAILWAY, Davenport, Iowa, is engaged in track reconstruction work on Rockingham Road between Howell Street and Lincoln Avenue. The cost will be approximately \$12,500.

TRENTON & MERCER COUNTY TRACTION CORPORATION, Trenton, N. J., will extend its tracks about 2,000 ft. from Stuyvesant Avenue to the Hilltonia section.

WHEELING TRACTION COMPANY, Wheeling, W. Va., has commenced work on replacing the northbound tracks along Warwood Avenue between North Sixth and North Eleventh Streets.

SAN DIEGO ELECTRIC RAILWAY, San Diego, Cal., was recently reported as completing reconstruction of double track on Kettner Boulevard between Broadway and Market Street and north track on Market between Kettner and Atlantic Streets, comprising some 3,300 ft. of equivalent single track. This line was constructed in 1901 and serves the ferry service between San Diego and Coronado, and although 26 years old is reported to be still in excellent condition, not having handled very short headways. The new track is being built with the steel tie-concrete ballast type of construction, the standard adopted by this company for trackage in paved city streets, and is estimated to cost approximately \$50,000.

TRADE NOTES

C. J. MARTIN joined the forces of the National Pneumatic Company, Chicago, Ill., as mechanical expert in the Western territory, operating out of the Chicago office, effective on Sept. 1.

LONG MANUFACTURING COMPANY, Detroit, Mich., manufacturer of automotive radiators and clutches, has announced through J. L. Dryden the breaking of ground Oct. 1 for the first unit of its new factories, which will be located at Dequindre, corner of Hellick. The new unit will house the clutch division and power house and will be of

one-story brick construction, 128 ft. by 402 ft.

R. L. WILSON, works manager of the East Pittsburgh Works of the Westinghouse Electric & Manufacturing Company, has been made assistant to vice-president and general manager, and J. M. Hipple, manager of the company's motor engineering department, succeeds Mr. Wilson as works manager, according to a recent announcement by F. A. Merrick, vice-president and general manager.

J. J. HILT has been appointed sales manager of the Young Radiator Company, Racine, Wis. He was formerly connected with the Racine Radiator Company and its predecessor, the Perfex Radiator Company.

TIMKEN ROLLER BEARING COMPANY, Canton, Ohio, and M. B. U. Dewar & Co. London, England, have, together, purchased from Vickers, Ltd., all of the capital stock of British Timken, Ltd. This purchase, it is understood, gives Timken complete control, throughout the world, of the manufacture and sale of Timken bearings. The Birmingham plant of British Timken, Ltd., is being enlarged. Officials of British Timken Ltd., were reported as being at the Canton, Ohio, works making final arrangements for the immediate establishing of factories in France and Germany.

AMERICAN ENGINEERING COMPANY, Philadelphia, announces the appointment of R. H. McGredy as Philadelphia sales manager of the Lo-Hed Hoist Division of the company.

ADVERTISING LITERATURE

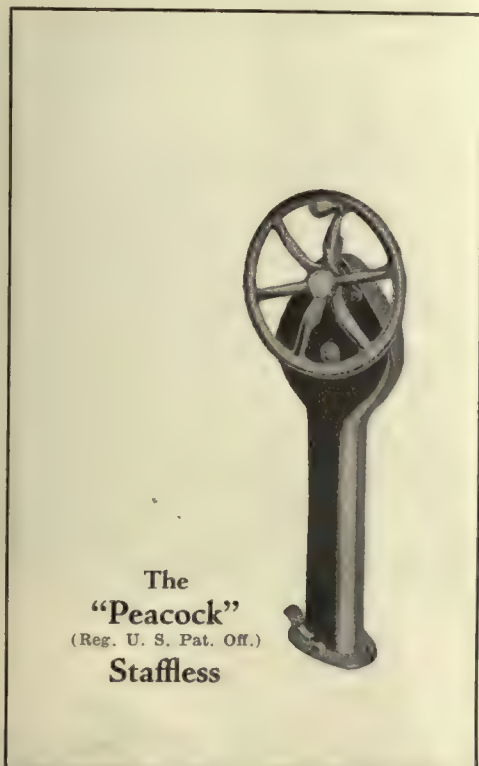
OHIO BRASS COMPANY, Mansfield, Ohio, is mailing a folder which presents the features of the O-B trolley wheels and harps.

PYROMETER INSTRUMENT COMPANY, New York City, has recently issued bulletin, No. 20, describing the construction and operation of "Pyro" radiating pyrometers.

CONDIT ELECTRICAL MANUFACTURING CORPORATION, Boston, Mass., has issued a folder announcing the Condit type E-20, with thermal control.

GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y., is distributing fifteen-page pamphlet for looseleaf binding, entitled GEA-763, descriptive of induction motor panels, isolated type 220, 440, 550 and 2,200 volts, 25 to 60 cycles, three-phase, non-grounded, three-wire for motor with wound or squirrel-cage motors. It is also distributing the same form literature dealing with station oil circuit breakers, type FHK, FKO, FHK and FHKO-236; static oil circuit breakers, type FK-230 and FHK-230.

W. E. CALDWELL COMPANY, Louisville, Ky., has recently distributed the 38th annual edition of its tank and boiler catalog. A complete line of tanks and towers is presented, with adequate explanatory notes.



Be insistent —and safe

THERE are many street railway executives—we will be glad to tell you of them—who insist upon Peacock Staffless Brakes as a final measure of safety in emergency equipment.

It is an insistent preference earned in the vast majority of cases by actual service—positive operation in the emergency—a report of an accident avoided instead of a crash.

Your hand brake equipment is always a timely topic. It is an excellent idea to arrange for tests. We have shown many railway officials how nearly useless the ordinary hand brake equipment is. And then by applying the same tests to Peacock Staffless Brakes—we leave the decision to any observer.

Peacock Staffless installation costs are moderate and the maintenance charges almost nil.

National Brake Co., Inc.
890 Ellicott Sq., Buffalo, N. Y.

Canadian Representative: Lyman Tube & Supply Company, Limited, Montreal, Canada



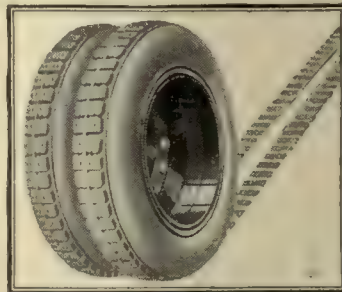
“We are averaging about 27,000 miles to the set of tires” . . .

SAYS G. T. Elliott of the Southern Coach Company, Greensboro, North Carolina, “and we *know* that we could not get this mileage if we were not using Budd Duals.

“During the past year we kept a close watch on all our buses. We have 12 Whites, 2 Commerce, and 1 Cadillac—all equipped with Budd Duals.

“Our records show that these buses have covered 85,000 miles a month—or over a million miles during the year without a wheel failure.”

POSITIVE PERMANENT ALIGNMENT



GREATER TIRE MILEAGE

100,000 buses and trucks are averaging from 15,000 to 20,000 miles to the set of tires on Budd Duals—

Because Budd Duals *always* run as true as an arrow—

They have no demountable rims, no rim clamps—So you can't get a tire on crooked.

This positive, *permanent* alignment is made possible by Budd Dual design.

BUDD Wheel Company
Detroit



40 *Seated Passengers*

40 COMFORTABLE STANDEES



AMERICAN CAR AND FOUNDRY MOTORS COMPANY
30 CHURCH STREET, NEW YORK

40
+40

Now - Greatly Increased Income without Proportionately Higher Cost

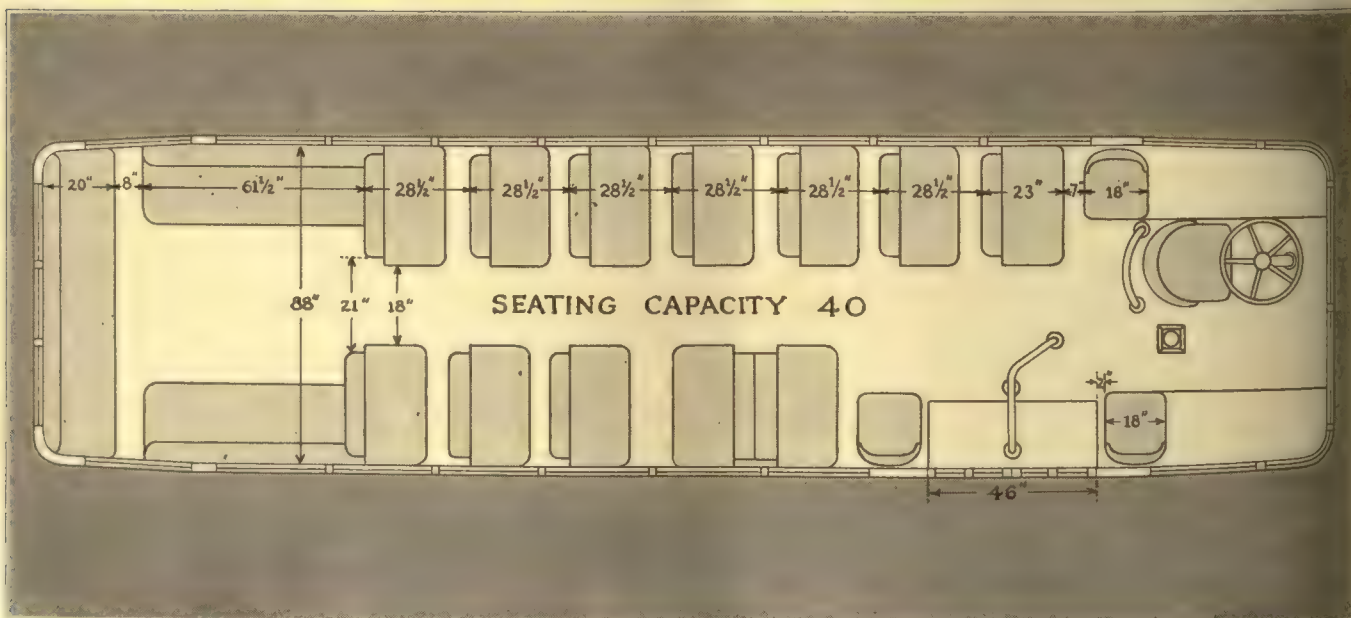
The Q. C. C. Metropolitan Coach seats 40 passengers in characteristic Q. C. C. comfort. 40 more passengers can stand comfortably without crowding. And the maximum loading is 100 revenue passengers. Now there is a motor coach to rival any other mass transportation equipment in ability to provide a high total of passenger-miles per vehicle-mile.

To achieve such highly desirable results Q. C. C. departs widely from conventional standards of coach designing. The all-steel structural framing, the floor plan, and the external appearance closely resemble modern rail passenger carriers. Q. C. C. mass transportation experience has made it possible to incorporate the most advanced ideas in rail-car building in a mobile unit.

On city lines, in densely populated areas, the conventional coach admittedly lacks capacity to profitably supplement rail service during peak-load periods. 25-passenger buses, for example, handle only 50 without undue crowding. And overcrowding always tends to turn away prospective passengers. The usual remedy of trippers to take the overload has frequently meant a disproportionately large investment in equipment, not justified by the net revenue available.

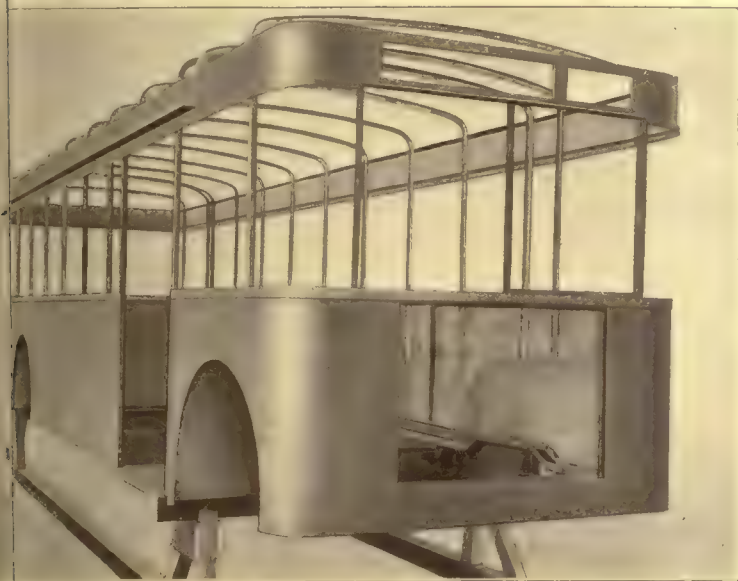
The Q. C. C. Metropolitan Coach will nearly double the number of seats and the standee space available at peak hours, without increasing the base schedule or the coach-mile expense. Hence ratio of income to operating expense can be radically improved.

Note particularly the driving position. This is behind the front axle, as in conventional coach design. Q. C. C. Metropolitan Coaches can be handled without special training and without constant alertness to special conditions.





Except for the wheel housing the combination body-frame structure of Q. C. F. Metropolitan Coaches could hardly be distinguished from the best in modern street car design. The many pillars and deep top rail give extreme fore-and-aft stiffness. The deep all-steel side panels assure extreme rigidity throughout.



All-Steel Body forms the Frame!

Stronger and More Spacious,
with Rail-Car Life Expectancy

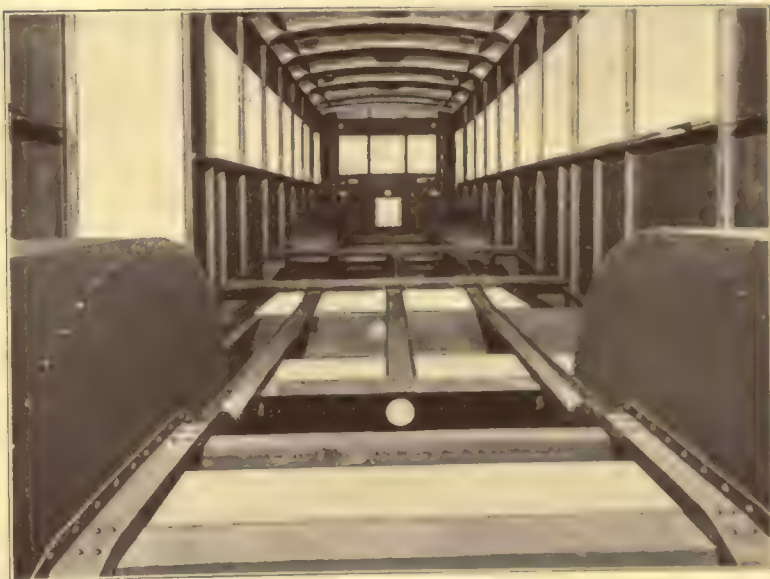
The Q. C. F. Metropolitan Coach has an all-steel *combined* frame and body. Structural strength comparable to that of all-steel railroad cars is now built into a motor coach by Q. C. F. The entire structural framing of the Metropolitan Coach contributes stiffest resistance to lateral and vertical deflection and distortion. The truss principle, exemplifying accepted practice in bridge building, is followed in this Q. C. F. construction. Advanced design secures adequate road clearance, con-

venient step and floor levels, while holding overall height within pleasing proportions.

Differing radically from the old automotive idea of a separate frame and body, the Q. C. F. Metropolitan Coach is made up of inter-related assemblies of steel members which simultaneously form frame and body structure. This unit structure rides on the axles and springs, which can be detached for overhaul, just as rail trucks are rolled out.

Increased revenue space is obtained, for practically every square foot of space is available within the body for passenger revenue. No longer is one-third of the street length given over non-productively!

Here is every requisite for profitable urban coach operation. The Metropolitan Coach plainly indicates how Q. C. F. mass transportation experience can always be marked up on your profit side.



Three 7" steel channels act as sills, while deep stiff steel channels and angles comprise the floor beams. The T-shape pillars are also evident.

40
+40

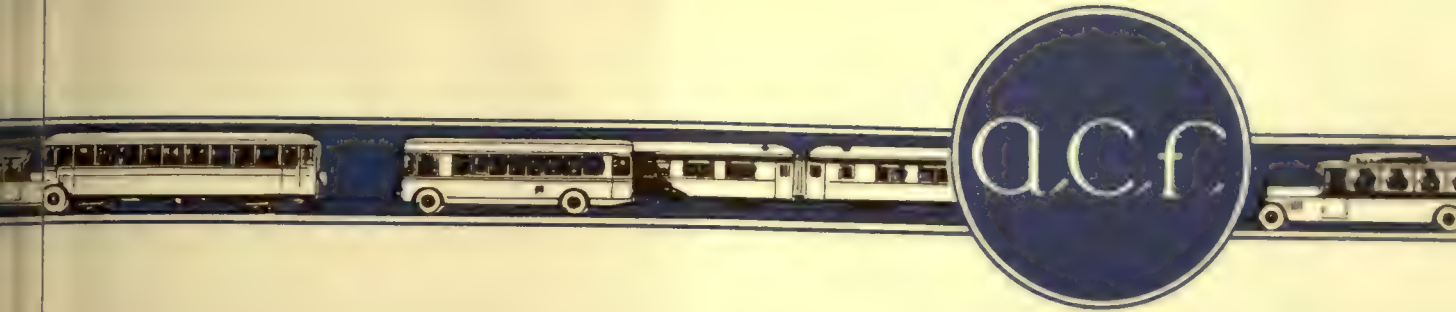


Parlor Car Attractiveness

From its very fundamentals, to the very last detail, the Q. C. F. Metropolitan Coach brings the highest known standards of profitable mass transportation into the field of motor coach operation. The Transportation Department as well as the Operating Department will find all of their requirements met as never before.

There is no objectionable overhang of the

body. The turning radius is only 38 feet. Handling is facilitated by the amazingly easy steering which Q. C. F. engineers have developed expressly for this vehicle. The steering wheel of a passenger automobile turns no more easily. Traffic maneuvers, parking and storing can be accomplished with great saving of time and effort. Driver proficiency is maintained throughout working hours.



with Street Car Capacity

Without exceeding conventional coach length, the Q. C. F. Metropolitan Coach, 30 feet overall, provides 40 revenue seats and space for 40 to 60 additional standee fares. Load balance has been most successfully worked out. Wheel load is correctly distributed—with 80 passengers aboard, the load per tire is 400 pounds below manufacturer's rating.

Rapid loading and unloading are facilitated by

two air-operated double leaf doors. Incoming passengers are impelled slightly forward to the fare-box, and are separated from the outgoing line by a polished aluminum hand-rail.

The deep-cushion leather-upholstered seats each accommodate two passengers comfortably. Ample leg room is provided by the wide spacing and recessed seat-backs. The aisle width is 21 inches. Moving passengers

40 +40

Visibility, driving and door controls, and fare box position are scientifically worked out in accord with the most successful transportation practice.

The clear floor area attracts passengers and makes for faster handling under peak load conditions. Wide, deep-cushioned, leather-upholstered seats increase the riding habit.



and standees pass freely. The large open floor space at the rear entices standees rearward. Steadying handles are suspended from the roof.

Four large ventilators and an exclusive warm-air heating system assure comfort at all seasons. An interior capacity of almost 1,500 cubic feet, means

more than 35 cubic feet of air per seated passenger.

Windows are high enough to allow standees to observe street signs and landmarks, avoiding late rushes to alight. Glazing is Grade AA sheet glass, giving clear, undistorted vision. Sash are drawn brass with combination lifts and latches for convenience.

Ten 21 C. P. lamps with diffusing lenses afford ample illumination without shadow or glare. Recessed lights in step-wells contribute to greater safety.

Interior refinement has been carried far beyond previous urban coach practice. Ceiling finish is in white egg-shell lacquer, non-glaring and readily cleaned. Mouldings, pillar trim and car-card frames are mahogany finish. Below the sill-line, there is a durable seal-brown surface, while seat-back frames and pedestals are olive-green.

From the Transportation Department's viewpoint, the Metropolitan Coach has the most outstanding requisites for profitable mass transportation. Only Q. C. C. universal experience and vision could produce it.

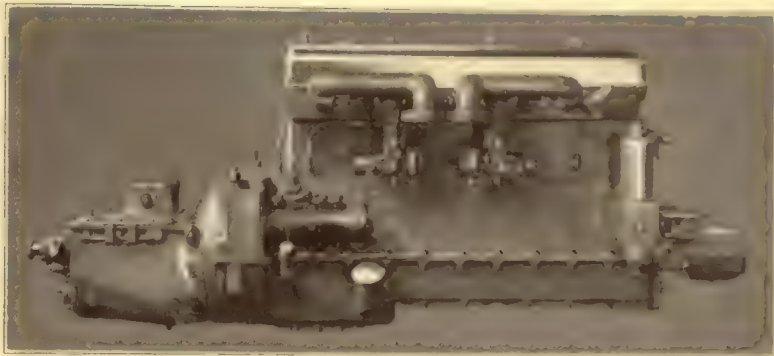


Over the engine a pair of two passenger seats, back to back, form a gas-tight housing. Practically every square foot within the coach is thus devoted to revenue-gaining space. Every detail reflects the broad experience of Q. C. C. with most successful mass transportation equipment of all types.



300,000,000 Mile A.C.F. Power Plant

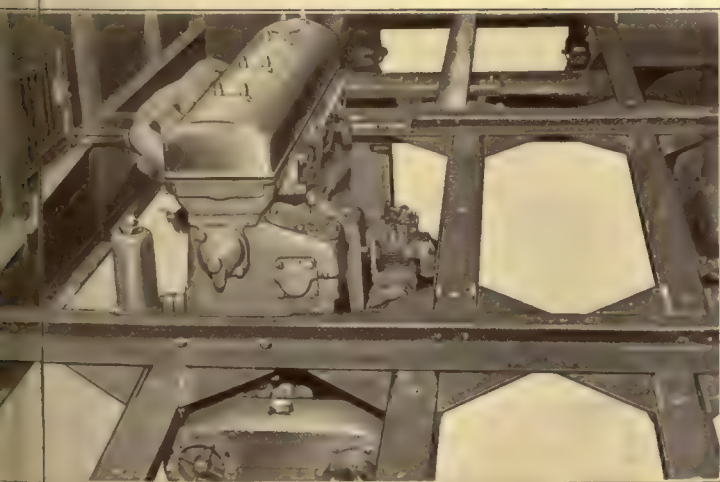
The A.C.F. Metropolitan Coach has a power plant relatively as advanced as the remarkable structural design and revenue possibilities. The power source is a 6-cylinder $4\frac{1}{4}'' \times 5\frac{1}{2}''$ Hall-Scott engine, of ability proven in every transportation field by more than 300,000,000 miles of conspicuous success—often under conditions thought to be “death to engines.”



Twin carburetors wring full power from the fuel while a two-part exhaust manifold reduces back pressure. The manually actuated starter guarantees reliability. A large oil filter purifies continuously—only clean, fresh oil reaches working parts. A 600-watt generator is supplied. Air-compressor capacity of 6 cubic feet is ample to keep adequate pressure in the reserve tank.

Alignments of the wheelbase but offset in the floor framing, the engine is on steel channels which transmit weight and torque reaction to the truss-like structural framing. Smoothness is enhanced by the fact that the Hall-Scott engine is so nearly vibrationless inherently that dampers, buffers and shock absorbing contrivances have never been required. At only 1600 r. p. m. nearly 100 h. p. is delivered. Only three speed changes are necessary in the gear-set, unit-mounted

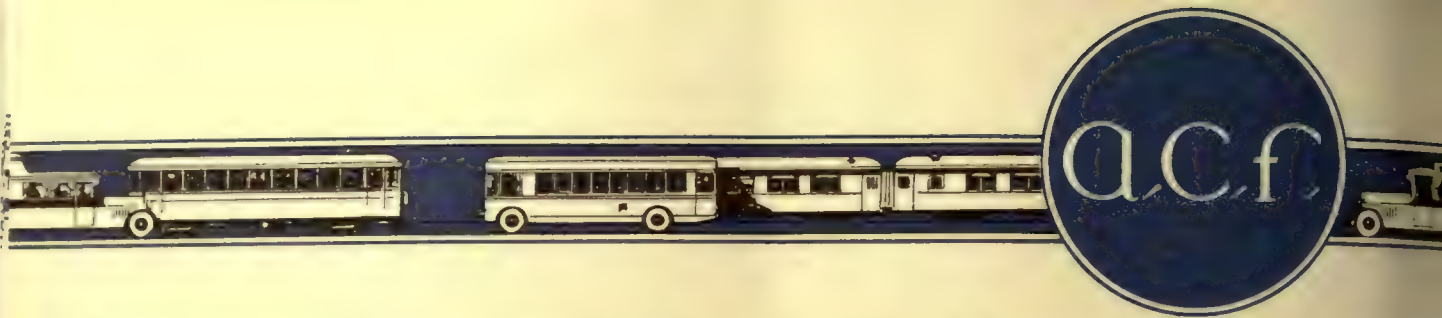
with the engine and single plate clutch. Eliminating the usual fourth speed permits provision for faster acceleration in first and second gears, and a radical decrease in total gear changes daily. Fast schedules can be comfortably maintained without top speed over 30 m. p. h.



The three-speed gearset, with its wide-face gears and heavy short shafts, permits more enduring construction and greater quiet. The short drive shaft transmitting power to a full-floating worm axle assures smooth, trouble-proof drive. Whipping tendencies are eliminated, and with concentration of stresses avoided by the novel coach structure, urban mass transportation becomes the smoothest ever known.

Maintenance and minor adjustment are very convenient, due to the engine position. The cylinder head may be easily removed and a spare, with valves ground and adjusted, substituted in less than an hour. Timing may be adjusted through hand-ports in the crank case. For a complete overhaul, usually not needed under 150,000 miles, the entire power plant can be dropped in a pit and a spare plant can be speedily substituted. A single spare cylinder head and power plant virtually insures continuous operation of 10 to 20 Metropolitan Coaches. Similarly axles and wheels can be rolled from beneath the coach, as in street car practice.

In the final analysis the Metropolitan design means a saving, at full passenger load, of more than 100 pounds per seat over any other type with the same overall dimensions. Total weight is only 1,000 pounds more than that of well built coaches of conventional capacity, yet fuel and tire costs may be figured at only 10% more!



Metropolitan All-Steel 40 Passenger Coach

A.C.F. Model 511-1H1

A careful study of the specifications reveals exactly how A.C.F. has conceived and built a spacious, attractive, single-deck coach with fully 25 per cent more seating capacity than previous urban types, offering every opportunity for more dollar income. But operating expense per seat mile obviously does not begin to increase in proportion to the revenue possibilities.

Capacity: 40 seated passengers.

Arrangement: For one-man operation with double right-front, air-operated doors for entrance and exit.

General Dimensions

Length: Over attached spring bumpers.....	31' 0"
Over integral bumper-bars.....	30' 0"
Width: Overall.....	96"
Over rear tires (38 x 9").....	95 3/4"
Over guard rails.....	95"
Inside at belt rails.....	88"
Aisle, between seat backs.....	21"
Aisle, between seat cushions.....	18"
Height: Ground to roof.....	112"
Ground to step.....	14"
Step to platform.....	12"
Ground to platform.....	26"
Ground to side sills.....	14"
Ground to window sills.....	56"
Headroom: Minimum under roof carlines.....	77"
Wheelbase	230"
Overhang ahead of front axle.....	38 1/2"
Overhang back of rear axle.....	95 1/2"
Tread: Front.....	78"
Rear.....	74"
Road Clearance, minimum.....	8"
Turning Radius, right or left.....	38' 0"

Structural Framing (all-steel)

Underframe

Center Sills: Three 5" steel channels extending the full length of the coach from front to rear bumper-bars and riveted securely to all cross floor-beams. Intermediate side channels riveted to steel wheel-housings.

Side Sills: 2 x 2 x 3/16 steel angles continuous around coach with curved sections welded in to form exterior face of wheel-housings.

Floor Beams: Zee-section structural steel, riveted to underframe members, pillars and paneling. Connection by large steel gusset plates. Both horizontal and vertical gussets employed to minimize body deformation in all planes.

Torsional Bracing: To prevent twist due to driving reaction from the springs or dynamic load from inequalities in the road, two tubular torsion members are placed at either end of the rear springs. Tubular members welded into square cast-steel braces which in turn are riveted to the side-sill angle and its mate 16" above.

Bumper Bar: Non-telescoping front-end as developed in railroad practice. Seven-inch structural steel channel curved to shape of front end of body with 1/8" steel plate, 8" wide, riveted to top flange as an integral part of the structural framing of the coach. Eliminates possibility of front end collapsing from collision-impact.

Engine Bed Framing: At right midway between axles. Power plant supported on 7" steel channels placed at floor level. Channels in turn supported by side sills and underframe center sills gusseted to vertical pillars and body paneling as well as floor beams. Entire structural framing of coach supports engine directly or indirectly.

Car Body Framing

Pillars: Tee-section in one continuous piece from the sill on one side up over the top and down to the sill on the opposite side. Pillars and carlines are one and the same.

Top Rail: 11" x 1/8" plate.

Side Panels: No. 16 gauge sheet-steel panels riveted to sills, floor support angles and vertical pillars to form, in effect, plate girders. All sheet steel of patent level grade or equal, smooth and free from surface defects.

Wheelhousings: Side sills curved up over wheels. Heavy steel plate shaped to form wheelhouse carries similarly curved steel angle along interior edge. Vertical plate riveted to this angle and to underframe channels make the wheel-house an integral part of the structural framing which stiffens the front end of the body rather than detracting strength.

Side Framing: Side-sill angle and a similar angle 16" above and parallel to it connected by the side-panel sheeting to form, in effect, a plate girder 16" deep as the main load-carrying structural members of the coach.

Spring Mounting, Rear: Cast-steel brackets clamped to tubular torsional members are prevented from turning by riveted connection to floor channels. Driving reaction from wheels transmitted directly to structural framing of the sides of coach and its underframe. Vertical load transmitted directly to 16" plate girders.

Spring Mounting, Front: Cast steel brackets riveted to front bumper channel and to first cross-channel of floor framing. Front spring load transmitted directly to underframe and side framing of coach.

Power Plant

Engine: Hall-Scott six-cylinder.....	4 1/4 x 5 1/2"
Carburetor—Plain tube, compensating.....	1 1/2"
Ignition—High-tension coil and distributor.....	
Radiator—Finned-tube, capacity gallons.....	12
Fans—Two four-blade, diameter.....	18"
Generator—12-volt, capacity in watts.....	600
Starting Motor—Gear drive to flywheel.....	

Clutch: Single-plate dry disc.

Transmission: Sliding gear, speeds forward..... 3

Propeller Shaft: One piece, tubular.

Universal Joints: Spicer, number..... 2

Front Axle: I-beam, drop-forged, beam size..... 3 1/2 x 2 3/4"

Rear Axle: Type, full floating, drive..... Worm
Housing diameter at spring seats..... 5"

Steering Gear: Screw and lever type.

Steering wheel, polished walnut, diameter..... 22"

Service Brakes: Internal expanding four-wheel.

Size, front..... 16 1/2 x 4" Rear..... 16 1/2 x 6"

Application—Westinghouse air-operated.

Materials—Metal-to-metal.

Emergency Brake: Disc type on drive shaft..... Dia. 16"

Tires: Front, single, high pressure..... 38 x 9"

Rear, dual, high pressure..... 38 x 9"

Wheels: Demountable steel disc.

Springs: Front, semi-elliptic single stage..... 49 x 4"

Rear, three-stage semi-elliptic..... 64 x 5"

Gasoline Tank: On right side, capacity gallons..... 80

Weight: Coach only (approximate) lbs..... 17,000

Per seated passenger (approx.) lbs..... 400

Per passenger, 80-passenger load, lbs..... 200

Tire load with 80-passengers, lbs..... 4,600

Rated load, 38 x 9" tire, lbs..... 5,000

AMERICAN CAR AND FOUNDRY MOTORS COMPANY
30 CHURCH STREET, NEW YORK

101 YEARS OF MANUFACTURING EXPERIENCE

Cane Webbing may be ordered through any H-W sales office.



Interior of one of the Eastern Mass. Street Railway cars, showing the installation of our No. 327-M.



A MODERN CAR SEAT!

THE Eastern Massachusetts Street Railway was in the market for a modern car seat that would increase the attractiveness and comfort of its cars. It finally selected our 327-M—the new, fast-selling Heywood-Wakefield design shown above.

This seat has deep, double spring cushions. Mechanism rails are set in. The individual backs are properly pitched for comfort.

Our car seating experts will be glad to help you decide on the best seating equipment for your needs. This service is free through any H-W sales office.

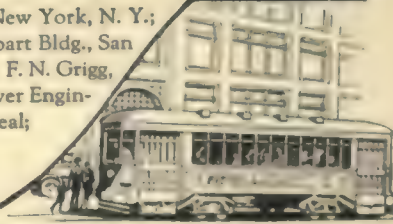
We shall be glad to send you complete information on this practical seat, as well as a copy of our new Bus Seat Catalogue.



Heywood-Wakefield

REG. U.S. PAT. OFF.

Heywood-Wakefield Co., Wakefield, Mass.; 516 West 34th St., New York, N. Y.; 439 Railway Exchange Bldg., Chicago, Ill. H. G. Cook, Hobart Bldg., San Francisco, Cal. The G. F. Cotter Supply Co., Houston, Texas. F. N. Grigg, 630 Louisiana Ave., Washington, D. C. The Railway & Power Engineering Corp., 133 Eastern Ave., Toronto; Montreal; Winnipeg, Canada.





This Growing Recognition of INDUSTRIAL ADVERTISING

Within one year McGraw-Hill Publications have gained 500 industrial advertisers and 3,000 industrial advertising pages. Now 3,500 advertisers are using 48,000 pages annually in McGraw-Hill Publications to help industry buy more intelligently.

* * * *

A study of this growth shows that old and new advertisers alike are recognizing more and more the business-building value of Industrial Advertising. It shows, too, that their advertising agents and bankers are recognizing its fundamental soundness—its minimum of waste.

* * * *

Among these 500 new McGraw-Hill advertisers are a number of good sized concerns, who, after searching investigations, have discovered the importance

of authoritative industrial publications to the men who buy or influence the buying of what they have to sell. These concerns are using specialized Industrial Advertising for the first time—with continuous schedules in McGraw-Hill Publications.

* * * *

Many of these 500 new McGraw-Hill advertisers, however, are newcomers to the industrial field. Their capital is limited. Their advertising schedules are consequently small. But—in their ranks are the industrial leaders of another generation. Tomorrow—bankers, lawyers and advertising agents will sense with pride their good fortune in serving them. For they are starting out no differently than today's leading industries who were little advertising fellows in McGraw-Hill Publications 10, 20 and 40 years ago.



McGraw-Hill Publishing Company, Inc., New York, Chicago, Philadelphia, Cleveland, St. Louis, San Francisco, London. Publishers of

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ELECTRICAL WORLD
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ENGINEERING NEWS-RECORD
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AMERICAN MACHINIST
INDUSTRIAL ENGINEERING
CHEMICAL & METALLURGICAL ENGINEERING

Catalogs and Directories

McGraw-Hill Electrical Engineering Catalog
McGraw-Hill Electrical Trade Catalog
McGraw Central Station Directory
Keystone Coal Mining Catalog
McGraw Electric Railway Directory
Keystone Metal Quarry Catalog
Metal Quarry Directory
Keystone Coal Buyers Catalog
Coal Field Directory
Bonbright Survey of Electric Power & Light Companies in the U. S.

Radio

RADIO RETAILING

Transportation

BUS TRANSPORTATION
ELECTRIC RAILWAY JOURNAL

Mining

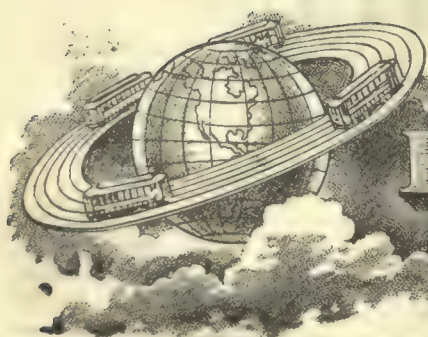
COAL AGE
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ENGINEERING & MINING JOURNAL

Overseas

INGENIERIA INTERNACIONAL
AMERICAN MACHINIST
(EUROPEAN EDITION)

6000 PAGES USED ANNUALLY BY 3,500 INDUSTRIAL ADVERTISERS TO HELP INDUSTRY BUY MORE INTELLIGENTLY

JUST as the electric railway companies have to compile and be guided by exhaustive statistics as to peak loads, traffic densities, costs per mile, and so forth, we must constantly keep ourselves informed as to purchasing power, density of population and all vital market information in order to maintain our service as an active asset of your service.

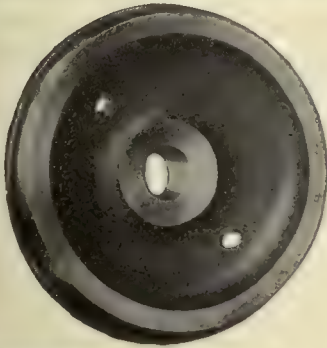
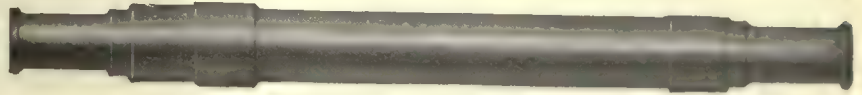


Barron G. Collier

INCORPORATED

CANDLER BLDG. NEW YORK

more miles—



Safely with

BETHLEHEM *Rolled Steel Wheels and Forged Steel Axles*

(Formerly known as CAMBRIA Wheels and Axles)

in

Electric Railway Service

*Other Bethlehem Products for
Electric Railways*

Axles, bolts, frogs, rails, armature shafts, pole line material, special layouts, switch stands, gear blanks, gage rods, splice bars, switches, crossings, guard rails, tie plates, tie rods, trackwork and spikes.



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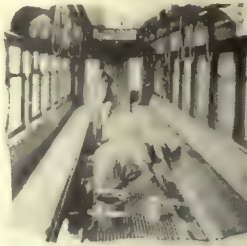
General Offices: BETHLEHEM, PA.

District Offices in New York, Boston, Philadelphia, Baltimore, Washington, Atlanta, Pittsburgh, Buffalo, Cleveland, Cincinnati, Chicago, Detroit, St. Louis, San Francisco, Los Angeles, Seattle, Portland.

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Sole Exporter of our Commercial Products

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Everyone likes Oakite cleaning



GET in touch with any street railway company where Oakite cleaning materials are used, and you will find everyone in the organization who has anything to do with cleaning, prefers to clean the Oakite way.

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Industrial Cleaning Materials and Methods

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INSULATOR
REG. U. S. PAT. OFF.

and EMPIRE
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Micanite and Super-Micanite
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Compounds, Varnishes, Etc.

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*Largest manufacturers in the world of mica insulation.
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Works: Schenectady, New York. Victoriaville, Canada; London, England



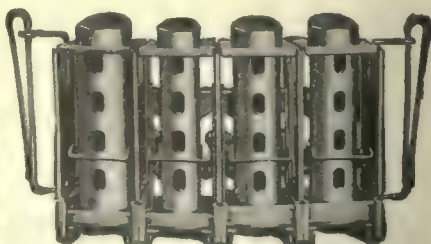
JOHNSON FARE COLLECTING SYSTEMS



Johnson Electric Fare Boxes and overhead registers make possible the instantaneous registering and counting of every fare. Revenues are increased 1½ to 5% and the efficiency of one-man operation is materially increased. Over 4000 already in use.

When more than two coins are used as fare, the Type D Johnson Fare Box is the best manually operated registration system. Over 50,000 in use.

Johnson Change-Makers are designed to function with odd fare and metal tickets selling at fractional rates. It is possible to use each barrel separately or in groups to meet local conditions. Each barrel can be adjusted to eject from one to five coins or one to six tickets.



Johnson Fare Box Co.

4619 Ravenswood Ave., Chicago, Ill.

Used and Surplus Equipment

INDIVIDUAL items of used equipment, or surplus new equipment, or complete plants, are disposed of (and found) through advertising in the *Searchlight* Section of this paper.

This is the section which so effectively aided the Government in selling the many millions of dollars worth of surplus material and equipment accumulated during the war without disturbing the market.

"SEARCHLIGHT"



COLUMBIA

Railway Supplies and Equipment

Machine and
Sheet Metal Work

Forgings
Special Machinery
and Patterns

Grey Iron and
Brass Castings

Armature and
Field Coils.

The Columbia Machine Works and M. I. Co.
265 Chestnut St., corner Atlantic Ave.,
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AXLES

MORE than sixty years of experience in the manufacture of axles, coupled with every facility for correct heat treatment and accurate testing, insure the meeting of the specification in the finished product.

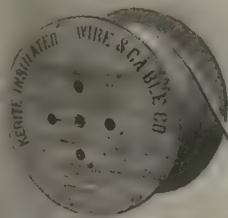
Prompt deliveries of Car and Tender Axles, Engine Truck and Driving Axles, Electric Motor and Street Car Axles, Miscellaneous Forgings.

CARNEGIE STEEL COMPANY

General Offices - Carnegie Building - 434 Fifth Avenue
PITTSBURGH PENNSYLVANIA



1836



KERITE

in a half-century of
continuous production,
has spun out a record
of performance
that is
unequalled in the
history of insulated
wires and cables

THE KERITE INSULATED COMPANY INC.
NEW YORK CHICAGO

Why



Le Carbone? Carbon Brushes?

Reason No. 11

If it were possible to estimate the number of the tow-ins and the tie-ups which have been avoided by "Le Carbone" Carbon Brushes, these figures easily would constitute the *only* reason needed for their use.

They talk for themselves

W. J. Jeandron

Factory Terminal Bldg.

Fifteenth Street, Hoboken, N. J.

Pittsburgh Office: 631 Wabash Bldg.

Chicago Office: 1057 Monadnock Block

San Francisco Office: 525 Market Street

Canadian Distributors: Lyman Tube & Supply Co., Ltd.
Montreal and Toronto

Bankers and Engineers

Ford, Bacon & Davis Incorporated Engineers

115 Broadway, New York
PHILADELPHIA CHICAGO SAN FRANCISCO

The J. G. White Engineering Corporation

Engineers—Constructors

Oil Refineries and Pipe Lines, Steam and Water Power Plants, Transmission Systems, Hotels, Apartments, Office and Industrial Buildings, Railroads.

43 Exchange Place

New York

STONE & WEBSTER

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Design and Construction
Examinations Reports Appraisals
Industrial and Public Service Properties

NEW YORK BOSTON CHICAGO

THE BEELER ORGANIZATION

Transportation, Traffic, Operating Surveys
Better Service—Financial Reports
Appraisals—Management

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SANDERSON & PORTER ENGINEERS

PUBLIC UTILITIES & INDUSTRIALS

Design Construction Management
Examinations Reports Valuations

CHICAGO NEW YORK SAN FRANCISCO

ENGELHARDT W. HOLST

Consulting Engineers

Appraisals Reports Rates Service Investigation
Studies on Financial and Physical Rehabilitation
Reorganization Operation Management

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ALBERT S. RICHEY

ELECTRIC RAILWAY ENGINEER

WORCESTER, MASSACHUSETTS

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LINN & MARSHALL, Inc.

Financing — Engineering — Management

PUBLIC UTILITIES
ELECTRIC RAILWAYS — MOTOR BUSES —
GAS — ELECTRIC
25 Broadway, New York City

BUCHANAN & LAYNG CORPORATION

Engineering and Management, Construction
Financial Reports, Traffic Surveys
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1004 Citizens National Bank Bldg. Hanover: 2142 49 Wall Street

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VALUATIONS - MANAGEMENT

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HEMPHILL & WELLS

CONSULTING ENGINEERS

Gardner F. Wells Albert W. Hemphill

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INCORPORATED

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ENGINEERING CONSTRUCTION YOUNGSTOWN, O. FINANCING MANAGEMENT

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REPORTS ON

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111 W. Washington Street, Chicago, Ill.

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ENGINEERING AND CONSTRUCTION

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Transportation Problems—Power Developments
68 Trinity Place, New York

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E. H. FAILE & CO.

Designers of

Garages—Service Buildings—Terminals

441 LEXINGTON AVE. NEW YORK

WALTER JACKSON

Consultant on Fares and Motor Buses

The Weekly and Sunday Pass—Differential
Fares—Ride Selling

Holbrook Hall 5-W-3

160 Gramatan Ave., Mt. Vernon, N. Y.

THE BABCOCK & WILCOX COMPANY

85 LIBERTY STREET, NEW YORK

Builders since 1868 of
Water Tube Boilers
of continuing reliability

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PHILADELPHIA, Packard Building
PITTSBURGH, Farmers Deposit Bank Building
CLEVELAND, Guardian Building
CHICAGO, Marquette Building
CINCINNATI, Traction Building
ATLANTA, Candler Building
PHOENIX, ARIZ., Heard Building
DALLAS, TEX., Magnolia Building
HONOLULU, H. T., Castle & Cooke Building
PORTLAND, ORE., Gasco Building



WORKS
Bayonne, N. J.
Barberton, Ohio

Makers of Steam Superheaters
since 1898 and of Chain Grate
Stokers since 1893

BRANCH OFFICES

DETROIT, Ford Building
NEW ORLEANS, 344 Camp Street
HOUSTON, TEXAS, Electric Building
DENVER, 444 Seventeenth Street
SALT LAKE CITY, Kearns Building
SAN FRANCISCO, Sheldon Building
LOS ANGELES, Central Building
SEATTLE, L. C. Smith Building
HAVANA, CUBA, Calle de Aguilar 104
SAN JUAN, Porto Rico, Royal Bank Building

THE P. EDWARD WISH SERVICE

50 Church St.
NEW YORK

Street Railway Inspection
DETECTIVES

131 State St.
BOSTON

Byllesby Engineering & Management Corporation

231 S. La Salle Street, Chicago
New York San Francisco

When writing the advertiser for information or
prices, a mention of the Electric Railway
Journal would be appreciated.

Transmission Line and Special Crossing Structures, Catenary Bridges

WRITE FOR OUR NEW DESCRIPTIVE CATALOG

ARCHBOLD-BRADY CO.

Engineers and Contractors SYRACUSE, N. Y.

UNA

RAIL JOINTS
DYNAMOTORS
WELDING ROD

UNA Welding & Bonding Co.
Cleveland, Ohio.

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Brake Pins	Spring Post Bushings
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Brake Levers	Booster and Transom
Pedestal Gibs	Chafing Plates
Brake Pulcrums	Manganese Brake Heads
Turnbuckles	Manganese Truck Parts
Center Bearings	Bushings
Side Bearings	Bronze Bearings
	McArthur Turnbuckles

Can be purchased through the following
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Economy Electric Devices Co.
72 W. Van Buren St., Chicago, Ill.
F. F. Bodler,
903 Monadnock Bldg., San Francisco, Cal.
W. F. McKenney,
54 First Street, Portland, Oregon.
J. H. Denton,
1328 Broadway, New York City, N. Y.
A. W. Arlin,
519 Delta Bldg., Los Angeles, Cal.

Bemis Car Truck Company
Springfield, Mass.



Hale and Kilburn SEATS

Better Quality Seats
For Cars and Buses

Hale-Kilburn Co.
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RAIL GRINDERS AND WELDERS

Railway Track-work Co., Philadelphia

682

Hubbard

and COMPANY
PITTSBURGH OAKLAND CHICAGO

Car Heating and Ventilating

—are no longer operating problems. We can show you
how to take care of both with one equipment. The Peter
Smith Forced Ventilation Hot Air Heater will save, in
addition, 40% to 60% of the cost of any other car heat-
ing and ventilating system. Write for details.

The Peter Smith Heater Company
6209 Hamilton Ave., Detroit, Mich.



We make a specialty of
**ELECTRIC RAILWAY
LUBRICATION**

We solicit a test of TULC
on your equipment
The Universal Lubricating Co.

Cleveland, Ohio
Chicago Representatives: Jameson-Ross Company,
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AMERICAN BRIDGE COMPANY

EMPIRE BUILDING—71 BROADWAY NEW YORK, N. Y.

Manufacturers of Steel Structures of all classes
particularly BRIDGES AND BUILDINGS

ALSO STEEL BARGES FOR HARBORS AND RIVERS, STEEL TOWERS
FOR ELECTRIC TRANSMISSION, HEROULT ELECTRIC FURNACES, ETC.

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Philadelphia, Pa.
Boston, Mass.
Baltimore, Md.

PITTSBURGH, PA.
Cincinnati, Ohio
Cleveland, Ohio
Detroit, Mich.

CHICAGO, ILL.
St. Louis, Mo.
Denver, Colo.
Salt Lake City, Utah

Pacific Coast Representative:
U. S. Steel Products Co.,
Pacific Coast Dept.
San Francisco, Cal.
Los Angeles, Cal.
Portland, Ore.
Seattle, Wash.

Export Representative: United States Steel Products Co., 30 Church Street, New York.

Lorain Special Trackwork Girder Rails

Electrically Welded Joints

THE LORAIN STEEL COMPANY

Johnstown, Pa.

Sales Offices:

Atlanta Philadelphia Chicago Cleveland New York
Pittsburgh Dallas
Pacific Coast Representative:
United States Steel Products Company
Los Angeles Portland San Francisco Seattle
Export Representative:
United States Steel Products Company, New York, N. Y.

TISCO MANGANESE STEEL SPECIAL TRACKWORK

Wharton Tisco Manganese Steel Trackwork
will help you hold the up-keep down.

WM. WHARTON JR. & CO., INC.
Easton, Penna.

Kalamazoo Trolley Wheels

The value of Kalamazoo Trolley Wheels and Harps has been demonstrated by large and small electric railway systems for a period of thirty years. Being exclusive manufacturers, with no other lines to maintain, it is through the high quality of our product that we merit the large patronage we now enjoy. With the assurance that you pay no premium for quality we will appreciate your inquiries.



THE STAR BRASS WORKS
KALAMAZOO, MICH., U. S. A.

B. A. HEGEMAN, Jr., President H. A. HEGEMAN, First Vice-Pres. and Treas.
F. T. SARGENT, Secretary W. C. PETERS, Vice-Pres. Sales and Engineering

National Railway Appliance Co.

Graybar Building, 420 Lexington Ave., New York

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Munsey Bldg., Washington, D. C. 100 Boylston St., Boston, Mass.
Hegeman-Castle Corporation, Railway Exchange Building, Chicago, Ill.

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Tool Steel Gears and Pinions Ft. Pitt Spring & Mfg. Co.,
Anglo-American Varnish Co., Springs
Varnishes, Enamels, etc. Flaxlinum Insulation
National Hand Holds Anderson Slack Adjusters
Genesco Paint Oils Economy Electric Devices Co.
Dunham Hopper Door Device Power Saving and Inspection
Garland Ventilators Meters
Walter Tractor Snow Plows "Topseal" Lamps
Feasible Drop Brake Staffs Bus Lighting Equipment
Cowdry Automotive Brake Testing Machine



Reg. U. S. Pat. Office

AMELECTRIC PRODUCTS
BARE COPPER WIRE AND CABLE
TROLLEY WIRE
WEATHERPROOF WIRE
AND CABLE
PAPER INSULATED
UNDERGROUND CABLE
MAGNET WIRE

AMERICAN ELECTRICAL WORKS
PHILLIPSDALE, R. I.

Chicago, 20-22 West Randolph Street.
Cincinnati, Traction Bldg.; New York, 100 E. 42nd St.

THE WORLD'S STANDARD

"IRVINGTON"

Black and Yellow
Varnished Silk, Varnished Cambric, Varnished Paper
Irv-O-Slot Insulation Flexible Varnished Tubing
Insulating Varnishes and Compounds

Irvington Varnish & Insulator Co.
Irvington, N. J.

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E. M. Wolcott, Rochester White Supply Co., St. Louis
I. W. Levine, Montreal Clapp & LaMoree, Los Angeles
A. L. Gillies, Toronto Martin Woodard, Seattle
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SEARCHLIGHT SECTION

USED EQUIPMENT & NEW—BUSINESS OPPORTUNITIES

UNDISPLAYED—RATE PER WORD:

Positions Wanted, 4 cents a word, minimum 75 cents an insertion, payable in advance.
Positions Vacant and all other classifications, 8 cents a word, minimum charge \$2.00.
Proposals, 40 cents a line an insertion.

INFORMATION:

Box Numbers in care of any of our offices count 10 words additional in undisplayed ads.
Discount of 10% if one payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED—RATE PER INCH

1 to 3 inches.....\$1.50 an inch
4 to 7 inches.....4.50 do.
8 to 11 inches.....4.10 do.
Rates for larger sizes, or yearly rates, on request.
An advertising inch is measured vertically on one column, 3 columns—3.0 inches—4.0 a page.

POSITIONS WANTED

A working barn foreman can wind matures do any kind of wiring and controller repairs. 12 years' experience both single and double truck. PW-54, Electric Railway Journal, 1600 Arch St., Philadelphia, Pa.

EXECUTIVE'S assistant—young electrical engineer with thorough practical and professional engineering experience, on electric railway equipment. Know how to manage labor. Believe in the future of the electric railway and have original ideas, some of which have been put into successful practice. Not afraid of work. Can produce results as an executive's assistant or in similar capacity. PW-56, Electric Railway Journal, Tenth Ave. at 6th Street, New York.

SUPERINTENDENT bus operation. Experienced executive in charge of transportation and maintenance 50 motorbuses on large electric railway property. Previous experience assistant superintendent of transportation handling discipline, labor cases, etc. Excellent references. C. V. Wood, Jr., 145 State Street, Springfield, Mass.

POSITIONS WANTED

WOULD like to correspond with any company needing a high-grade official in any capacity, in city or interurban railways. Can manage any or all departments in the most efficient manner. PW-33, Electric Railway Journal, Guardian Bldg., Cleveland, O.

Keep your Eye
on the
**Searchlight
Section**
and your
Advertisements in it

0197

POSITIONS WANTED

SUPERINTENDENT transportation, qualified by wide experience, fine record in city and interurban operation and coordination rail and bus service. Exceptional ability in dealing successfully with labor, public, public officials, resulting in increased revenue, reduced operating costs. A progressive efficient operating official with high grade references. Correspondence invited. PW-53, Electric Railway Journal, Guardian Bldg., Cleveland, Ohio.

GENERAL superintendent or manager: fifteen years' successful experience. PW-55, Electric Railway Journal, Tenth Ave. at 36th St., New York.

FOR SALE

15 BIRNEY SAFETY CARS

Brill Built

West. 508 or G. E. 204 Motors
Cars Complete—Low Price—Fine Condition
ELECTRIC EQUIPMENT CO.
Commonwealth Bldg., Philadelphia, Pa.

Searchlight Results:

Positions Vacant:

"The strongest proof that your Searchlight Department finds its way to many readers is shown by the numerous letters we have received in answer to our recent advertisement."

Secretary—A Connecticut Railway Co.

"You gave us one good man as a result of a similar advertisement in the Electrical Railway Journal some time ago. Please give us another."

Proprietor of Steel Sales Agency.

Positions Wanted:

"The result of advertising in the Searchlight Section of your Electric Railway Journal I have secured a position with The ——— Traction Co. of W. Va."

"I received 8 replies and accepted a position with the ——— Railway Co. with over 30% increase in salary."

Business Opportunity:

Advertisement for investment to develop or acquire Traction Light & Power. "The results from the advertisement in Electric Railway Journal have been satisfactory."

New York City Attorney.

Equipment For Sale:

"Our advertisement in the Electric Railway Journal located a buyer, and I have disposed of the car in question."

President—Buffalo Industrial Plant.

"We have disposed of all of our Girder Rails advertised in your paper. We are frank to tell you that the material went to three different traction lines and represents three separate and distinct new accounts. Our idea is that when it comes to bringing something to buyers in the traction field, there is but one sheet, and that is yours."

Dealer—New York City.

"There is no necessity for the continuation of this advertising, for the reason that we could have sold this equipment five times over from the advertisement that was run one time."

Superintendent—A Pennsylvania Railway Co.

Equipment Wanted:

"The two insertions of this advertisement which you displayed in admirable manner were sufficient to obtain for us the exact equipment that we desired."

Superintendent—A New England Railway Co.

For Every Business Want: "Think Searchlight First"

WHAT AND WHERE TO BUY

Equipment, Apparatus and Supplies Used by the Electric Railway Industry
with Names of Manufacturers and Distributors Advertising in this Issue

Advertising, Street Car
Collier, Inc., Barron G.

Air Brakes
General Electric Co.
Westinghouse Air Brake Co.

Anchors, Guy
Elec. Service Supplies Co.
General Electric Co.
Ohio Brass Co.
Westinghouse E. & M. Co.

Armature Shop Tools
Columbia Machine Works
Elec. Service Supplies Co.

Automatic Return Switch
Stands
Ramapo Ajax Corp.

Automatic Safety Switch
Stands
Ramapo Ajax Corp.

Axles
Bemis Car Truck Co.
Bethlehem Steel Co.
Brill Co., The J. G.
Carnegie Steel Co.
Cincinnati Car Co.
Illinois Steel Co.
St. Louis Car Co.
Standard Steel Works
Taylor Electric Truck Co.
Westinghouse E. & M. Co.

Babbittin Devices
Columbia Machine Works
& M. I. Co.

Saddles and Buttons
Elec. Service Supplies Co.
International Register Co.
American Bridge Co.

Batteries, Dry
Nichols-Latern Co.

Bearings and Bearing Metals
Bemis Car Truck Co.
Brill Co., The J. G.
Cincinnati Car Co.
Columbia Machine Works
& M. I. Co.
St. Louis Car Co.
Taylor Electric Truck Co.
Westinghouse E. & M. Co.

Bearings, Center and Roller
Brill Co., The J. G.
Cincinnati Car Co.
Columbia Machine Works
Sucki Co., A.

Bearings, Roller
Timken Roller Bearing Co.

Bells and Buzzers
Consolidated Car Heating
Co.

Bells and Gongs
Brill Co., The J. G.
Cincinnati Car Co.
Columbia Machine Works
& M. I. Co.
Elec. Service Supplies Co.
St. Louis Car Co.

Benders, Rail
Railway Trackwork Co.

Bodies, Bus
Brill Co., The J. G.
Cummings Car & Coach Co.
St. Louis Car Co.

Body Material, Haskellite & Plymetal
Haskellite Mfg. Corp.

Bolts
Babcock & Wilcox Co.

Bolts & Nuts, Track
Illinois Steel Co.

Bond Testers
American Steel & Wire Co.
Electric Service Supplies Co.

Bonding Apparatus
American Steel & Wire Co.
Elec. Service Supplies Co.
Ohio Brass Co.
Railway Trackwork Co.
Una Welding & Bonding Co.

Bonds, Rail
American Steel & Wire Co.
Elec. Service Supplies Co.
General Electric Co.
Ohio Brass Co.
Railway Trackwork Co.
Una Welding & Bonding Co.
Westinghouse E. & M. Co.

Brackets and Cross Arms
(See also Poles, Ties,
Posts, etc.)
American Bridge Co.
Bates Expanded Steel
Truss Co.
Columbia Machine Works
Elec. Ry. Equipment Co.
Elec. Service Supplies Co.
General Electric Co.
Hubbard & Co.
Ohio Brass Co.

Brake Adjusters
Brill Co., The J. G.
Cincinnati Car Co.
National Ry. Appliance Co.
Westinghouse Tr. Br. Co.

Brake Shoes
American Brake Shoe &
Foundry Co.
Bemis Car Truck Co.

Brill Co., The J. G.
St. Louis Car Co.
Taylor Electric Truck Co.

Brake Testers
National Ry. Appliance Co.

Brakes, Brake Systems and Brake Parts
Bemis Car Truck Co.
Brill Co., The J. G.
Cincinnati Car Co.
Columbia Machine Works
& M. I. Co.
General Electric Co.
National Brake Co.
St. Louis Car Co.
Taylor Electric Truck Co.
Westinghouse Tr. Br. Co.

Brakes, Magnetic Rail
Cincinnati Car Co.

Bridges, Steel
American Bridge Co.

Brushes, Carbon
General Electric Co.
Jeandron, W. J.
LeCarbone Co.
Westinghouse E. & M. Co.

Brushholders
Columbia Machine Works
General Electric Co.

Buildings, Steel
American Bridge Co.

Bulkheads
Haskellite Mfg. Corp.

Bunkers, Coal
American Bridge Co.

Buses
Cummings Car & Coach Co.
General Electric Co.
Studebaker Corp. of
America
Yellow Truck & Coach Co.

Bus Lighting
National Ry. Appliance Co.

Bushings, Case Hardened and Manganese
Bemis Car Truck Co.
Brill Co., The J. G.
Cincinnati Car Co.
Columbia Machine Works
St. Louis Car Co.

Cables (See Wires and Cables)

Cambrie Tapes, Yellow and Black Varnish
General Electric Co.
Irvington Varnish & Ins.
Co.

Carbon Brushes (See Brushes, Carbon)

Car Lighting Fixtures
Elec. Service Supplies Co.

Car Panel Safety Switches
Consolidated Car Heating
Co.
Westinghouse E. & M. Co.

Car Steps, Safety
Cincinnati Car Co.

Car Wheels, Rolled Steel
Bethlehem Steel Co.

Cars, Dump
Brill Co., The J. G.
Differential Steel Car Co.
St. Louis Car Co.

Cars, Gas-Electric
Brill Co., The J. G.
General Electric Co.
Westinghouse E. & M. Co.

Cars, Gas, Rail
Brill Co., The J. G.
St. Louis Car Co.

Cars, Passenger, Freight, Express, etc.
American Car Co.
Brill Co., The J. G.
Cincinnati Car Co.
Cummings Car & Coach Co.
Kuhman Car Co., G. C.
St. Louis Car Co.
Wason Mfg. Co.

Cars, Second Hand
Electric Equipment Co.

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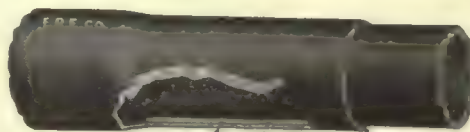
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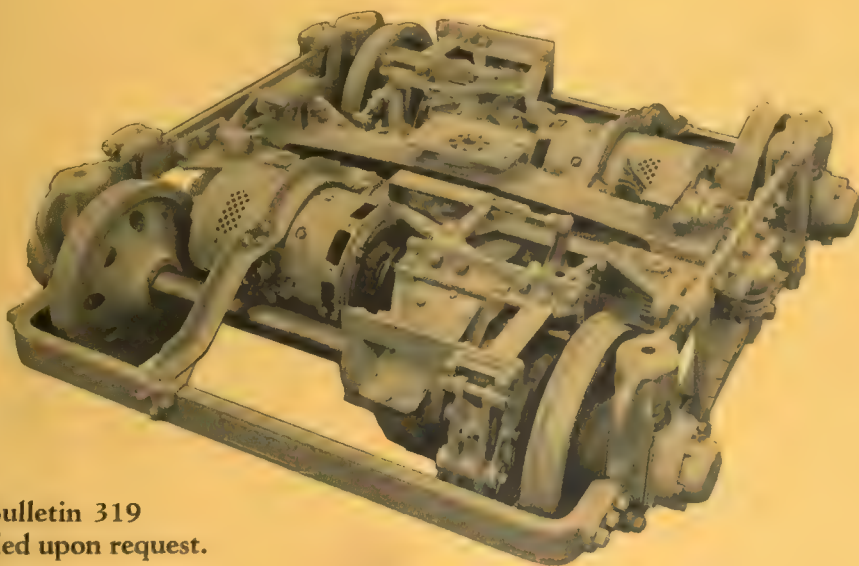
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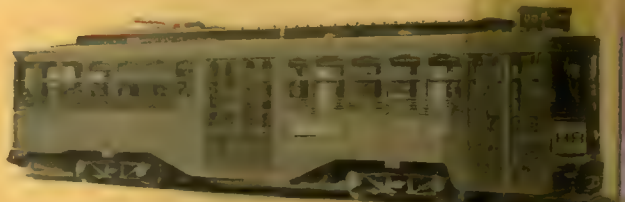
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